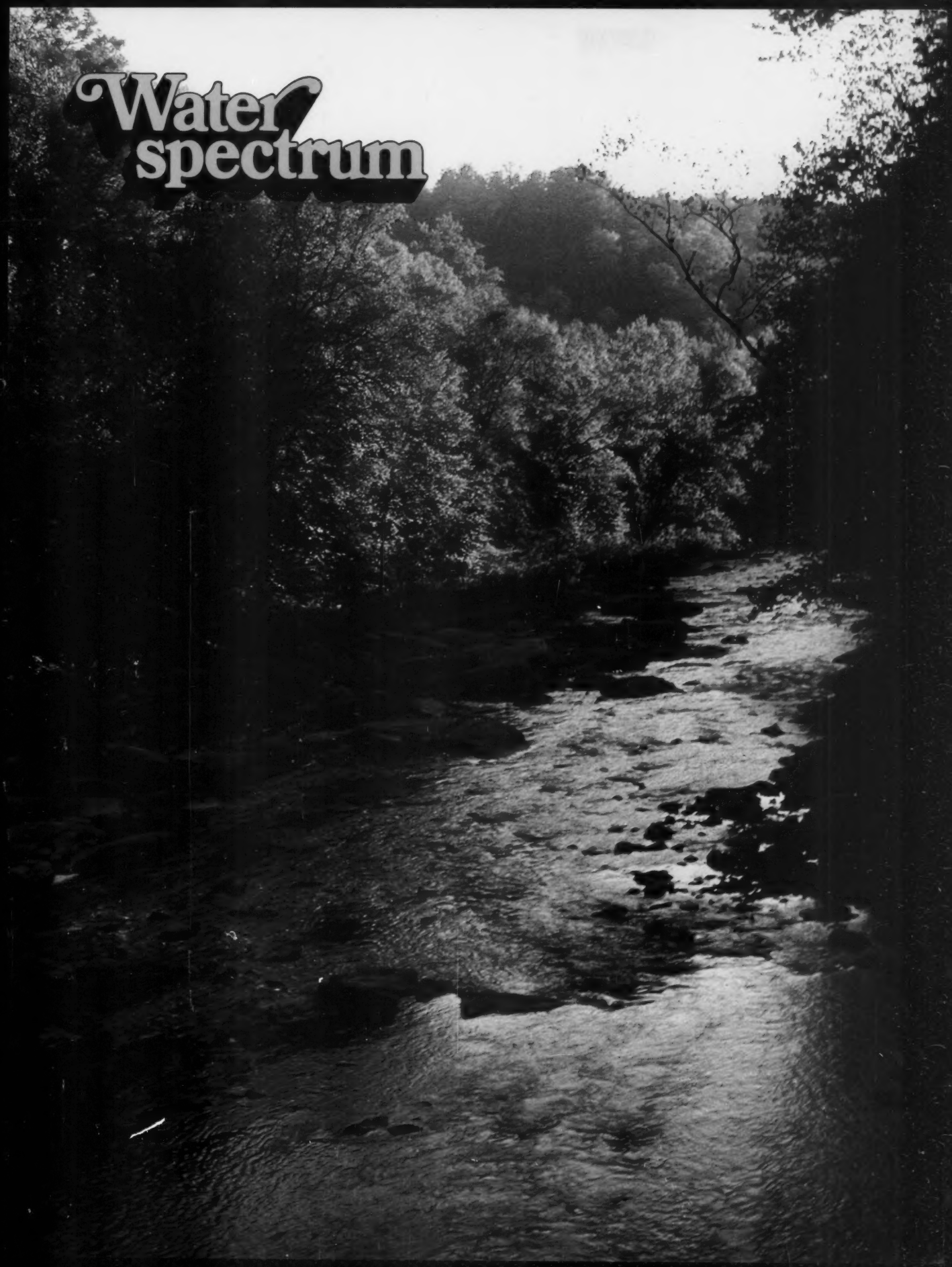
Water
spectrum

Water spectrum

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Martin Hoffmann

Assistant Secretary of the Army for Civil Works
Victor V. Veysey

Chief of Engineers
Lt. Gen. W. C. Gribble, Jr.

Director of Civil Works
Maj. Gen. Ernest Graves

Editor
Seymour Reitman

Editorial Assistant
Linda Brzezenski

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Editor, Water Spectrum
Office, Chief of Engineers
Department of the Army
Washington, D.C. 20314

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COVER: Rock-bound, scenic setting represents a type of outdoor recreation resources that a "now" society demands. See page 16.

In mid-September 1975 Major General J. W. Morris relinquished his post as Director of Civil Works to become Deputy Chief of Engineers. In doing so, he left behind a job and a challenge he had enjoyed more than any other he had ever held. Since the spring of 1972 General Morris had been in a position that required him to lead the Corps of Engineers in coming to terms with the challenging provisions of the National Environmental Protection Act (NEPA) of 1969. His tour of duty encompassed that period when the Corps was hardest put to implement through action what NEPA requested in mere words. A task easier talked about than done. *Water Spectrum,* therefore, asked the out-going director to discuss the accomplishments of the U.S. Army Corps of Engineers in overcoming some of the major environmental problems faced during his 3-year tour.

A TIME FOR REFLECTION

To start with, the policy organizational changes which have been made from top to bottom are fundamental to all the rest. These changes were made so that the U.S. Army Corps of Engineers, in accomplishing its mission, could give proper and full consideration to the environmental effects of proposed solutions to the Nation's water problems. Few people realize that we have now augmented our internal staffing so that decision makers at all levels have full environmental advice available which can be input into the decision making process.

Among activities, I would have to put the regulatory program high on the list of things the Corps has done in recent years, particularly where the program controls abuses to the Nation's environmental assets.

We can put nonstructural approaches to solving flood problems near the top of the list, too, since it was Corps initiative that unleashed the great potential that exists here in dealing with flood control. Among other areas in which we have made significant progress, I feel that the Corps studies and the adjustments we are making in our maintenance program, particularly the dredging portion, are important.

Which specific areas of environmental concern would you say deserve the most attention at this particular time?

I think our efforts to protect the wetlands must continue to get highest priority. We can approach this problem from two directions: not only to *protect* the wetlands we have, but also—which I think is completely reasonable to anticipate—being able to *produce* wetlands.

Our flood control problems also require a new look. While I think there are probably going to be continuing needs for structures to store excess waters, I would like to see much more attention given to the nonstructural solutions as the first option. We are moving that way rapidly. A related area that needs a lot of attention, and provides great opportunities for the future, is a full analysis of flood plains throughout the country. We need

One method of flood plain management.

complete identification of what is there now, an inventory of the environmental assets and development of sufficient hydrologic data to identify the areas susceptible to flood damages. This information can then be turned over to the local governments to keep our flood plains from being unwisely developed and thereby minimize future problems.

A third area that still deserves a lot of attention is water pollution. This is basically EPA's (Environmental Protection Agency) and not the Corps' primary responsibility, but we certainly can help. The last, but not necessarily the least important, problem requiring priority attention is our urban areas. We've allowed water resources problems to develop where our people are concentrated. We need to do a lot more work to be sure we're not encouraging unnecessary flood damages, to provide energy where it's needed, to keep water supply available for our people, and to avoid building problems for the long term.

Continuing in the environmental vein, the Corps also is responsible for maintaining domestic waterways. What happens when the Corps is instructed to stop dredging at a particular location?

When the courts tell us to stop dredging we do as the courts direct. Of course we are usually given such instruction on an injunctive or temporary basis either because, in the courts' opinion, we've not fully complied with or not satisfied some requirements of the law. Therefore, the stoppage usually is dependent upon or limited by certain actions which we are expected to take. We then make adjustments and, hopefully, are able to resolve the legal cause of the stoppage. The instructions to stop dredging have been relatively few and, almost always, we've been able to resolve the issues.

Suppose the Corps cannot resolve the issues and is told to stop dredging. What alternatives are there?

There really aren't too many alternatives since natural processes tend to make the rivers shallower. The only alternatives then would be less utilization of that waterway or port, or changes in the configuration of the shipping fleet that uses it. I really don't feel the alternatives need be that severe; I think the problem is finding alternative methods of dredging so that we can continue to operate the waterways.

Besides dredging, are there other problems that affect navigation?

Yes. We have a continuing problem concerning the efficiency of the existing structures, or locks. Many of our locks are old and not as efficient as we would like to see them. Some are inadequate for the volume of today's traffic, others are reaching the point in age where they served their usefulness and need to be replaced for safety reasons. So we have a continuing problem on our waterways: not only in keeping channels at authorized depths, but also in modernizing and replacing our locks and, in some cases, maintaining channel alignment through bank stabilization and control structures.

Such an extensive maintenance program implies outlay of a large amount of dollars. Would it be feasible to lay user charges on some of the waterway operators to help defray the costs of some of these improvements?

That's really not a matter in which I've been involved officially, although I have been responsible for the operation of the waterways. I understand, however, that current administration policy favors some user fees or some use charges to offset operation and maintenance costs. My personal feeling is these charges will be passed on directly to the consumers. Since the waterway operators constitute a very competitive industry, there really isn't enough profit in their operations to allow them to absorb the charges. Thus the charges must be added to the cost of the products being transported, which means the consumer, in effect, will pay the user fees. Fees would probably have some effect on our international trade situation also, since our export costs would have to be increased as well. I am inclined to think it would be to

the users' advantage if they offered a proposal. I would hope that whatever the alternate proposal would be, we wouldn't have to collect the money.

While NEPA introduced a national policy of concern for the overall environment, the Water Resources Development Act of 1974 was more specific in its requirements, including nonstructural flood control measures. What progress has the Corps made?

Both the policy and conception of nonstructural solution are excellent. That message has been well distributed throughout the Corps. From a practical standpoint, though, we don't seem to be getting very far because of the cost sharing features. To date there's been no national policy set on what the cost sharing should be on nonstructural measures. Admittedly, the law sets forth some limits, but the U.S. Water Resources Council has the chore of coming up with a position which will be applicable to all elements of the executive branch. As far as I know, the Council has been unsuccessful in getting its recommendations approved. I'm disappointed that progress has been so slow on this feature because nonstructural measures are so important, but cannot be implemented until the cost sharing problems are resolved.

The 1974 Act also directed the President to look into the Principles and Standards applied to water resource projects, including the discount rates. What impact will this have on Corps projects?

I don't think the national Principles and Standards are going to have any major impact. At first we thought they would be more severe, but now that we've put together our regulations on how to develop the two objectives of ***national economic development*** and ***environmental quality,*** we find we can adapt very nicely. One of the things that's attractive to me is that if we do the ***environmental quality*** analysis properly then the need for a separate environmental impact statement (EIS) on the same project would be lessened. Even if we do not eliminate the EIS itself, we should be able to make the document which we're now preparing much simpler since we would save significant amounts of time and money. Those people interested in the details of environmental assessments can go to the environmental quality part of the project report document itself.

The Corps has traditionally made its flood plain management services, which are nonstructural, available to individual communities upon request. Would this service not become more effective on a regional level?

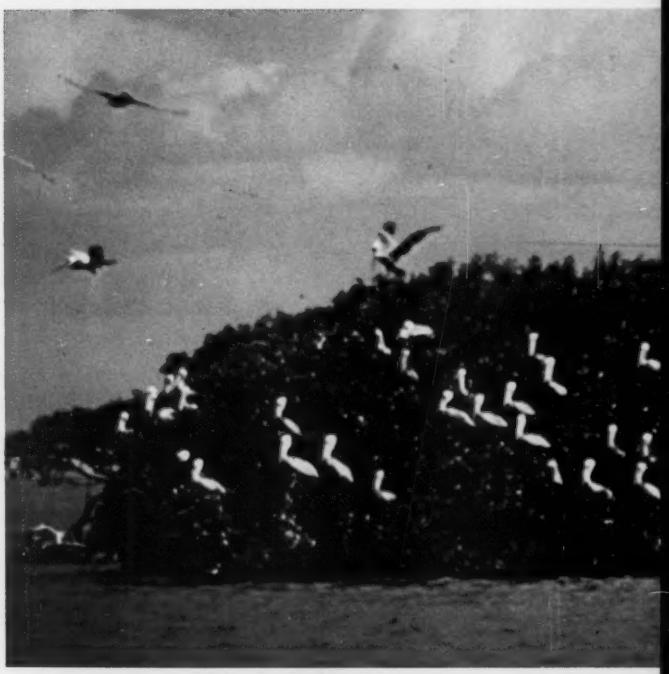
Definitely, and we need to come to that soon. First, we need the base data so that regional planners can have the information at hand with which to make their plans. The Corps can and should provide this service to the States and other Federal, as well as local, planning agencies. It's important and we really ought to get on with that.

While the public traditionally associates the Corps with flood prevention, not many persons realize the extent of Corps interest in supplying water to regions facing current or future shortages.

There's no question that many regions of the country have potentially critical situations and when drought conditions occur in these regions the problems will appear very rapidly. The most serious situation is right here in Washington. It would be devastating if we had a drought next year during the height of the Bicentennial.

Actually, the whole Northeast region of the United States has a potential water shortage and the Southwest already has its water problems. While there's ample water in the upper Missouri now, there's no reason to think that during a drought that area wouldn't be short

Dredged material converted to manmade island.



also. So you might say the United States has a pending water crisis which would be much more difficult to handle than either the energy or the economic situation which we now have. It's pretty hard to negotiate with Mother Nature when she decides to cut off the supply.

Would it be feasible to help Mother Nature by transporting water from areas of abundance to those of need?

I suppose so, but this is a very complicated subject and making it come true is probably more difficult than the average person might think. For one thing, there's the question of who owns the water. Does it belong to the States? Another problem is embargoes, some Federal, on moving water from certain basins to others, and there are even international agreements which preclude such transbasin shipments. So while it would be feasible from the engineering standpoint, there are political and regional constraints which, for a while at least, present very difficult obstacles.

Besides providing drinking water, will the Corps be able to increase the Nation's supply of electrical energy through further development of hydropower?

Most definitely! A great amount of energy exists in our rivers which could be converted into hydroelectric power. We need to take a hard look at the proper role of hydroelectric power, including pumped storage, in meeting the Nation's electric energy demands. We already know that hydroelectric developments provide a clean source of electric energy with little, if any, consumption or degradation of the water resource itself. There are great opportunities for hydroelectric power development in Alaska as well as the Pacific Northwest, some potential on the Missouri River, and in some of the existing facilities in the Southeast. Speaking comparatively, hydroelectric energy is a clean and nonconsumptive form of energy.

When construction projects disturb existing fish and wildlife habitat, what are the ecological results?

Generally speaking, the effect has been to change the fish and wildlife populations which were in a region before the project was developed. That's particularly true with our lake projects. With the help of the Fish and Wildlife Service we have replaced what was there with, in many cases, a better fish and wildlife population. In all cases that I'm aware of, once a project is in operation, the Corps has given constant attention to the matter of the species of fish and wildlife which choose to reside in that area.

On the human side, how will growth in visitations be managed?

We've learned an awful lot in the last 30 years or so about operating reservoirs and what masses of people can do to these pleasant and attractive areas. I think

the principal direction which lakeshore management will take from now on will be to preserve public lands so that they may be used for the pleasure of everyone. That will be done by limiting commercial uses to certain areas, limiting boat docks and recreation vehicles to other areas, and leaving some areas in a natural state. The thrust of lakeshore management, generally speaking, will be to keep an area from becoming degraded so that, over the long pull, public lands will provide the greatest amount of pleasure and use for all elements of the public.

Your concern over public lands indicates that appropriate public facilities should be included in the Corps' future lakeshore management plans.

They are part of our plans. However, facilities of the type you are referring to are provided only where a local non-Federal agency contributes 50 percent of the cost. Therefore, the extent to which these plans are implemented is dependent upon how much money other than Federal agencies are willing to put into them. The growing public demand for campsites, picnic areas and other facilities greatly exceeds availability and these areas will have to be expanded to meet local area requirements.

Although not as visible as those projects producing man-made lakes, the urban studies program appears to be even more multipurpose in nature.

Our urban study program is really a comprehensive analysis of all the water and related land problems in a highly populated, highly industrialized area. That includes items such as flood control, water supply, recreation, water quality, in some cases navigation, and in other cases hydroelectric power. Whatever the existing water and land related problems or opportunities might be, they are folded into an overall study for a given urban area.

Which of these items would you say appear to be receiving the most emphasis today?

That's very hard to generalize since the cities are all different and their water situations are all different. I think, certainly, water quality has to be put high on the list because of the law (P.L. 92-500) which says the cities will have reached certain levels of water quality and treatment facilities by certain fixed dates.

There are several new directions the Corps has been asked to pursue by Congress, such as streambank and shoreline erosion research, a new 2-stage authorization procedure and, perhaps most important, the deauthorization procedure. How are we progressing?

Let's take them in reverse order. The deauthorization procedure is moving very well. The Secretary of the Army has submitted a list of about 350 projects prepared by the Chief of Engineers that are recommended for deauthorization. I anticipate that Congress will

A better fish and wildlife population is a major concern to the Corps.

allow most, if not all, of these to be deauthorized by not overruling the recommendations. Next year there will be another list and the year after that and so forth. So that's working well.

The 2-stage authorization procedure has many good features to it. So far as we know, it's also working well, and I phrase it that way simply because we have not yet had a project move all the way through the system and back to the Congress under the 2-stage procedure. We see no great problem once we get all the pieces sorted out.

The third item is streambank and shoreline erosion, and this one, I must say, has been fairly disappointing to me because we've not had the funds to undertake these research programs as we should have. In the shoreline erosion area we have no money appropriated to date. We do have an advisory panel appointed as the law requires and we have taken $100,000 from other sources just to keep that panel working. As far as anything specific is concerned—such as picking a demonstration site—no decision has been made. The same thing is true, generally, with streambank erosion. There just haven't been any funds appropriated to allow us to proceed with these new initiatives.

Having briefly explored the major challenges you have faced as Director of Civil Works, it now seems appropriate to ask for your impression of the Corps' future Civil Works mission.

We should start with what we have as our current missions. Traditionally, that includes navigation, flood control and hydroelectric power. Navigation, I feel certain, will remain an integral part of the Nation's economic transportation system, but its place in the system will depend upon the national transportation policy and the relationship of water to other transportation modes. I think there's a definite continuing requirement here, so the Corps' mission in the navigation field probably will stay pretty active.

Flood control, though, is to me the one area where the changes in philosophy and approach have to be most significant and perhaps the most immediate. I feel that national attitudes no longer accept retention structures as the singularly correct solution to flood problems. Only after we have thoroughly exhausted all other alternatives, in particular those labeled nonstructural solutions, will the public accept structural solutions. This is quite a change in the national attitude which existed just 10 or 15 years ago. As a result, I see the Corps role in flood control changing significantly.

Allied with flood control is hydroelectric power. That seems to remain a priority issue because of the energy

Energy found in nature can be converted into clean, nonconsumptive hydroelectric power.

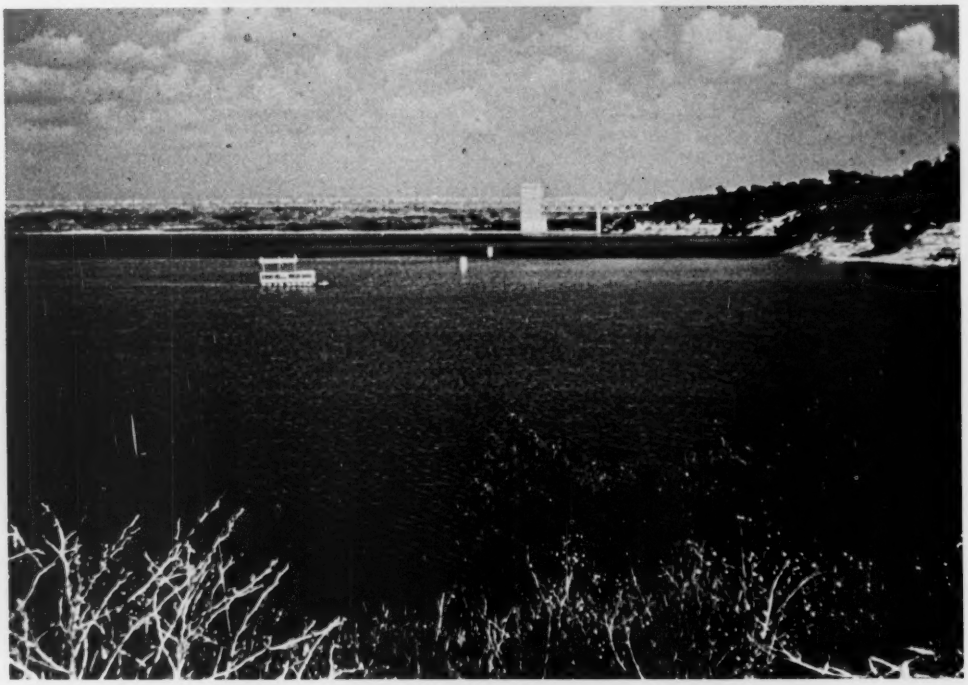
shortage. I feel that we will be providing more hydroelectric power both in existing and new structures. Hydroelectric power, like water supply, comes off a little better in the area of structural solutions than does flood control, simply because the water supply obviously must be obtained by storing water and hydroelectric power is most efficiently produced when water is impounded for the purpose of generating great amounts of energy during a release.

Looking beyond the structural areas, or what might be called the traditional missions which involve structural work, I see a great opportunity and a need for the Corps of Engineers to provide software service. By that I mean engineering advice that will help States develop their own State water plans. I'm particularly concerned that we look at our capability to resolve the quality of life issues, not only for today, but for the long term; also that we use our talents in developing flood plain data and environmental inventories, so that planners on a national, regional and even local basis have at hand good data on what's out there in order to make proper decisions in developing our water resources.

This software service would have its first priority input in urban areas, because there's where the problems already exist. The urban areas are a particular problem because our planning processes take so long that by the time we get an answer the going-in situation has changed. We have to be able to translate software planning into action much quicker than we have in the past. The next area where I see software service having immediate application is one I've already mentioned —the flood plain information and environmental inventory arena.

Another area of great opportunity is using the maintenance of our waterways as a catalyst for proper development of our river basins, and particularly the water courses themselves. I believe that working in conjunction with State and local fish and wildlife interests, the Department of the Interior and others, our activities in removing deposition from authorized waterways and maintaining these waterways can lead to optimum development of the physical features adjacent to our waterways. There's no reason why we cannot open up tributary areas in order to place the dredged material from the waterways in preselected sites. This would not only provide fish and wildlife habitat, but excellent recreation areas, and generally raise the environmental, industrial

Meeting growing demands for recreational facilities depends on cost-sharing.



Effective water supply sometimes requires impoundment.

and social utilization of these water courses to their most attractive and optimum levels.

What I've covered so far really are not new missions for the Corps. We are just approaching tomorrow from a better angle, using the authorities which the Congress already has given us for tending to our Nation's water needs. Beyond that, the U.S. Army Corps of Engineers is available for a variety of future challenges, just as it has been in the past. We can undertake additional tasks with our existing field organization and our engineering and planning talents if, in the judgment of the Congress and the executive branch, such use would serve the national interest.

If I may be permitted an additional observation along that theme, I see in the great planning, engineering and construction talents of the Civil Works element in the Corps of Engineers a unique management capability strong in experience and organization. I'd like to think these capacities are available to everyone —other elements of Federal Government as well as the States and local agencies—to assist in resolving the Nation's problems, whatever they may be, but especially those related to water. ■

NEW WORK FOR PUBLIC WORKS

by the Honorable Robert E. Jones

Appalachian Regional Commission

With the opening of the 94th Congress in January, the U.S. House of Representatives Committee on Public Works gained a new chairman, a new jurisdiction, and a new perspective. The new chairman, Robert E. Jones (D-Ala.), sees his Committee on Public Works and Transportation as tasked with supervising the expenditure of billions of taxpayers' dollars to improve the quality of life for the American citizen.

The House Committee on Public Works and Transportation exercises legislative authority over a broad sweep of national activities that profoundly influence the development of America and the lives of her people.

In the early life of the Nation, public works were linked directly and almost exclusively to the needs of commerce—roads, inland waterways, coastal harbors, and navigational aids. This initial emphasis soon broadened into new and more sophisticated forms of public works necessitated by the Nation's westward expansion and its growing interest in the markets of Europe and the Far East. Railroads received Federal land grants and the eastern rivers and harbors were overhauled to facilitate a growing maritime commerce. With the 1900's came realization that the arid lands of the West must be made fertile and the rivers harnessed. A new era of public works began and Congress turned its attention to irrigation and dams and flood control projects.

Until 1946, House involvement in the areas of public works came under the jurisdiction of four separate committees—Rivers and Harbors (established in 1883), Roads (1913), Flood Control (1916), and Public Buildings (1837). In 1946, the functions of the four committees were consolidated into subcommittees of a new Committee with the broader title of Public Works.

In recent decades there have been various alterations in the structure of that Committee, with the most significant being this year's reorganization. The former Public Works Committee was expanded to include two new areas—civil aviation and all surface transportation modes except railroads. Now, with six subcommittees on Water Resources, Surface Transportation, Public Buildings and Grounds, Economic Development, Investigations and Review, and Aviation, our all-important challenge is to make the optimum use of both public works and transportation investments. Our Public Works and Transportation Committee wants to use careful planning to give the future a more rational shape.

The Committee and Water Resources

Our efforts in this Congress are directed toward three major areas: employment, economic development, and planning for the future. In writing this article, I want to discuss the significance of public works and transportation policy as related to these three areas and the pivotal relationship of water to all our activities.

The Committee plans to work toward the most efficient and beneficial use of the Nation's water resources. This focus includes a reexamination of the means by which water resources projects are formulated and evaluated; consideration of adequate water supplies, deepwater port programs, and improvement of our inland waterway system; and an investigation of the Federal Government's role in waterborne transpor-

Stretch of road along Interstate 64 in Virginia symbolizes the Committee's responsibility for construction and maintenance of the national Interstate Highway System.

U.S. Department of Transportation/Federal Highway Administration

tation. I will comment on each of these Committee considerations.

Some modifications of the Water Pollution Control Act Amendments of 1972 (Public Law 92-500) are being considered in this session, but a decision on the majority of proposals is being deferred until the National Commission on Water Quality submits its report on the economic, social, and environmental effects of achieving the effluent limitations required by 1983. Additional legislation on water resources development may be required this year—depending on the submission of Corps of Engineers project reports. Also, under the authority of Section 80 of the Water Resources Development Act of 1974, the Water Resources Council is studying the principles and standards used in formulating and evaluating water resources projects and the means of dividing Federal and non-Federal cost sharing for such projects. Its recommendations, of major importance to the future of water resources development, are expected later this year.

More specifically, the Committee wants to consider multiple methods for flood control and water pollution abatement. For example, we should be able to more efficiently plan the Nation's highway construction so that roadfill can also function as a levee or be used protectively to block and concentrate polluted sediment until it can be treated. At 42,000 miles and a projected cost of $76 billion, the Interstate Highway System is the biggest public works project ever undertaken. The role of a project of this magnitude cannot be overestimated in terms of its effect on the Nation's growth patterns. We should be able to locate and extend these highways so that they function as an integral part of our total investment planning. Highways and waterways, as the physical links between communities, can be used to influence community planning and thus alter population growth and economic development.

Initially begun as a demonstration and technological experiment, West Virginia University's personal rapid transit system is being expanded to offer permanent service between the Morgantown campuses and the downtown area.

Appalachian Regional Commission

Airports can be planned to complement the characteristics of the surrounding land and water. Airports are often located on flood plains and even more frequently are sited next to rivers or harbors. Planners should more carefully consider the effect of the airport on the surrounding flood plain—it is likely that a facility of this size would increase the elevation and velocity of flood waters and thus magnify flood damage.

The Committee also wants to consider the design and construction of deepwater ports under the provisions of the Deepwater Port Act of 1974. The purposes of this act are to regulate commerce, promote efficiency in transportation, and protect the environment by establishing procedures for the location, construction, and operation of deepwater ports.

Improvements in the navigability of the Nation's harbors and streams also merit our consideration. This is particularly important now because of current economic and energy conditions and because about 60 percent of the freight moved on inland and intracoastal waterways is coal and petroleum products. The growth and expansion of water-based industries has traditionally been linked to the successful operation and maintenance of waterways and harbor facilities. Such industries provide an abundance of low cost basic materials for consumer goods industries and indirectly generate additional jobs and higher incomes. Industrial expansion also raises the taxation base of a community, which in turn helps provide local schools, hospitals, roads, and other community services. Modern highways permit workers residing in localities remote from a river to commute daily to jobs in these water-related industries. Thus, the mutual benefits shared by public works and transportation are many.

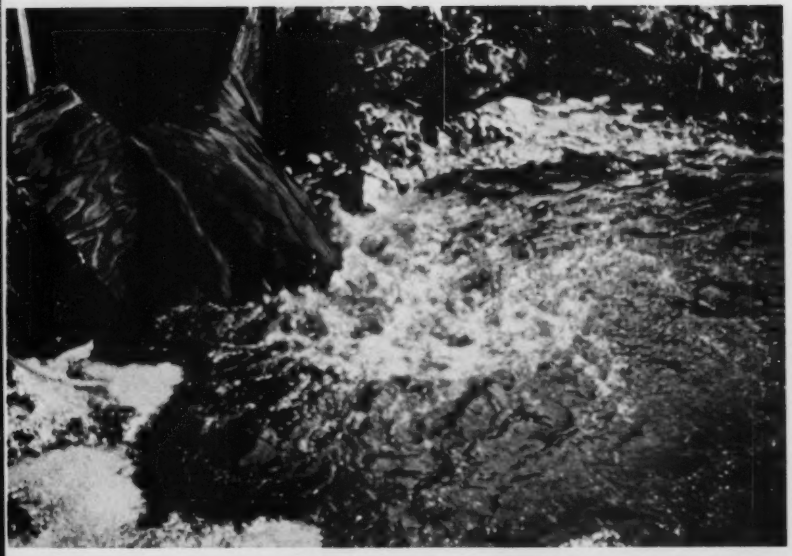
A long-range goal of our expanded Committee is to submit an overall plan of improvement for the inland navigation system that will maximize its net contribution to the Nation's total transportation system. It is important to maintain the dimensions and operating conditions of waterways so that they are safe and economical for waterborne commerce, but we do not want a disproportionate investment of time and effort on any particular navigation feature.

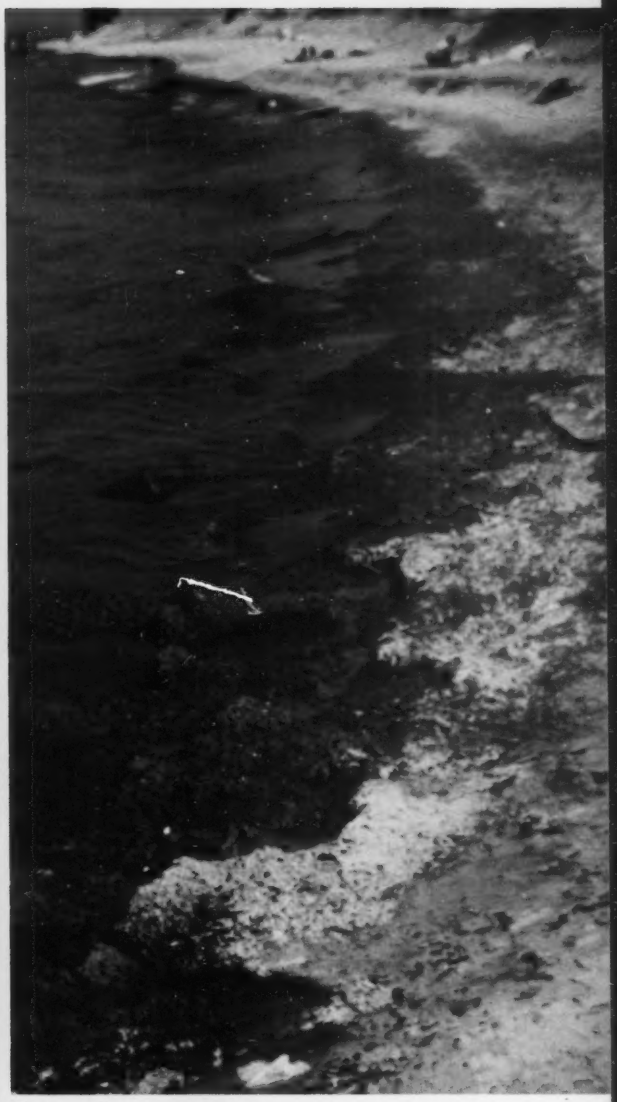
An Employment Plan

The Committee's long-range focus is economic development through "investment planning." By way of further explanation, we want to implement programs that will develop depressed areas and increase employment. And we can use public works and transportation policies to do so.

Among the pieces of legislation intended to stimulate employment is the Emergency Local Public Works and Capital Development Investment Act of 1975. It authorizes up to $5 billion for direct, 100 percent grants-in-aid to State and local governments for construction, repair, or other improvement of local public works facilities—projects of the type which can be initiated promptly and which will have an immediate impact on

The House Committee authorizes construction and maintenance of public buildings such as these Federal office buildings in Detroit, Michigan, and Dallas, Texas.





Water quality is a continuing concern of the Committee.

local unemployment. Stipulations are that each project must stimulate employment and be started within 90 days after grant approval. An additional feature is that the project will be automatically approved if a decision is not made on the application within 60 days after receipt. I consider passage of this type of legislation to be a clear signal that Congress is determined to break the rising spiral of unemployment.

Economic Development

As long ago as 1935, the National Resources Committee[1] wrote that regional planning should "confine itself to dealing with the physical resources and equipment out of which socio-economic progress arises."[2] At the time, the Federal Government's only point of entry into regional planning was through water resources. If water resources were developed for a multiplicity of uses within a watershed, it was hoped that social and economic advances would spin-off from that development. Thus, the physical setting for regional planning was always a major drainage basin organized for comprehensive resource development.

The overall strategy in developing the existing regional planning commissions was threefold: to alter supply characteristics by investment in the public infrastructure; to encourage new private investment and thereby induce self-generating growth; and to prevent

[1] The National Resources Committee, established by an Executive Order, was in existence from June 1935 to July 1939.

[2] *Regional Factors in National Planning* (U.S. Government Printing Office, 1935,) p 156.

re-emergence of depressed area problems by establishing Federal-multistate institutions with powers to initiate and coordinate regional plans and guide regional economic growth. The consensus developed that long-term economic planning for lagging regions was relatively ineffective if individual States operated economically only within their own boundaries and if Federal-State cooperation was molded by narrowly conceived bilateral deals between individual agencies and States. Multiple agency Federal involvement was seen as the genuine answer to the social and economic problems generated by unemployment and persistently low incomes within a multistate region.

Thus, an entirely new dimension in U.S. regional planning began in 1965 with the Public Works and Economic Development Act, which authorized the Coastal Plains, Four Corners, New England, Ozarks, Upper Great Lakes, Old West, and Pacific Northwest Regional Commissions, and the Appalachian Regional Development Act of 1965.

The Appalachian Regional Commission has jurisdiction over all of West Virginia and parts of 12 States extending along the Appalachian ridge from New York to the northern tiers of Alabama, Georgia, and Mississippi. In this Congress, Federal support of economic development programs in the 13-State Appalachian region is being continued through a renewal bill that authorizes $300 million for the highway program and $340 million for non-highway programs, such as pollution control, timber development, and special projects in the areas of health, education, and housing.

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION
(Chm-Robert E. Jones-Ala.)

Water Resources (Chm-Ray Roberts-Tex.)	**Economic Development** (Chm-Robert A. Roe-N.J.)
Surface Transportation (Chm-James J. Howard-N.J.)	**Investigations and Review** (Chm-Jim Wright-Tex.)
Public Buildings and Grounds (Chm-Teno Roncalio-Wyo.)	**Aviation** (Chm-Glenn M. Anderson-Calif.)

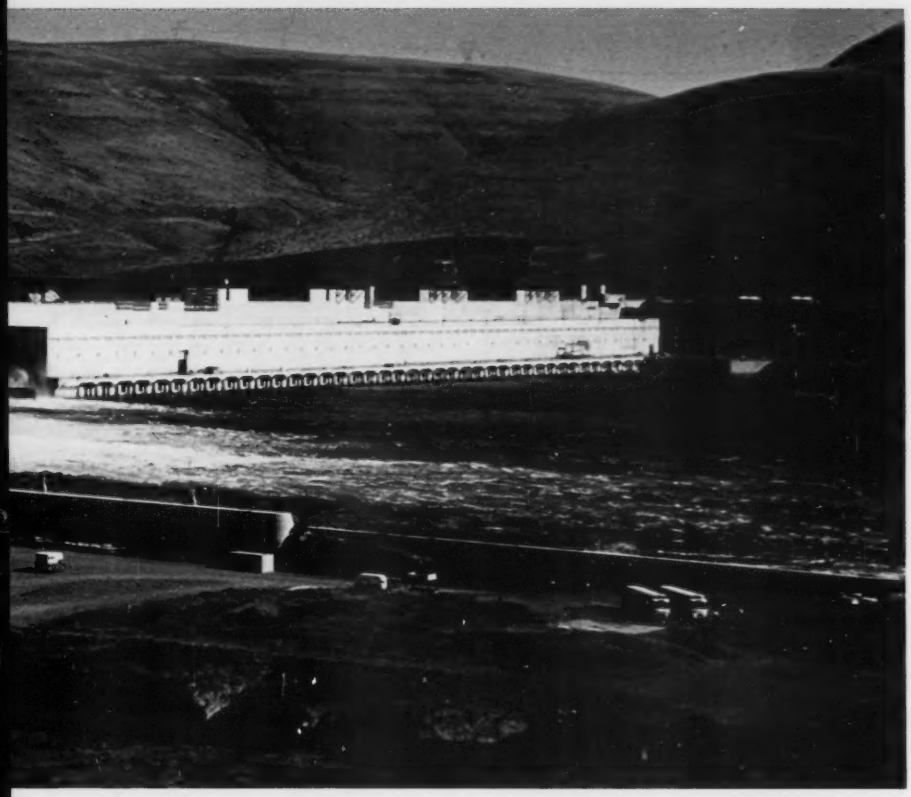
- Flood control and improvement of rivers and harbors
- Measures relating to Capitol Building and Senate and House Office Buildings
- Measures relating to construction and maintenance of roads
- Measures relating to construction and maintenance of buildings and grounds of the Botanic Gardens, the Library of Congress, and the Smithsonian Institute
- Measures relating to construction of post offices, customhouses, Federal courthouses, and Government buildings within the District of Columbia
- Oil and other pollution of navigable waters
- Public buildings and improved grounds of the United States
- Public works for the benefit of navigation
- Water power
- Transportation, including civil aviation, except railroads, railroad labor, and pensions
- Roads and their safety
- Water transportation subject to the jurisdiction of the Interstate Commerce Commission
- Related transportation regulatory agencies, except the Interstate Commerce Commission as it relates to railroads, the Federal Railroad Administration, and Amtrak

Structure and functions of the House Committee on Public Works and Transportation.

Committee jurisdiction includes maintenance of the Nation's waterways. Navigability improvements are particularly important in light of current economic and energy conditions.

Planning for the Future

All of the current legislation—on water resources, employment, and economic development—stresses a Committee emphasis on planning. Here is where a public works and transportation investment policy becomes crucial. Too often in the past similar projects have been used merely to "catch up" on the problems created by unplanned urban expansion, rather than as a force to



Hydroelectric power, another of the jurisdictional areas, is generated at several dams across the Nation.

shape more orderly growth of communities. However, there are steps we can take to make our declining rural areas and our decaying central cities—which share the problems of unemployment and a depressed economy —more attractive places to settle.

For example, we can make it more attractive to build high-density housing in the inner city to accommodate the smaller families and single individuals we expect would want to congregate there if suitable facilities were available. Also, better transportation links to rural areas can bring them within the orbit of the cities. And, we can switch planning for mass transportation systems from demonstration- to service-oriented programs. As an example of this program transition, the personal rapid transit system developed at West Virginia University's Morgantown campus can be converted into a viable transportation alternative for that city. The personal rapid transit system, generally referred to as PRT, is a sort of hybrid monorail and minibus, using fixed railways to guide small, driverless, computer-controlled cars. With a capacity of only 3,300 riders per hour, PRT is not to be regarded as a substitute for the faster, high-capacity rail systems, but it can be a convenient way of moving persons around downtown areas, airports, and campuses.

In formation of a public works and transportation policy, there are certain problem areas. For example, the Federal Government must come to terms with the inequality of public spending as it relates to different modes of transportation. This investment imbalance reflects a lack of comprehensive planning and policy oversight at different levels of government. It is all too obvious that we need to work on establishment of a consistent national policy on Federal sources of investment funds for transportation.

The related question of transportation subsidies is also complex and controversial—one that will not be quickly resolved. But the Committee wants to look at the problem and consider the various methods of equalizing Federal investments. One proposal is to tax all fuel used for commercial shallow-draft shipping and recreational boating on navigable waterways constructed and maintained at Federal expense. This proposal, along with others, will be reviewed by the Committee in its study of Federal and non-Federal cost sharing for water resources development.

Clearly, all transportation modes—air, land, and water—have a role to play in the total national requirement to move commodities and people, and each mode has unique advantages given a particular transportation objective. Frequently overlooked in the competition among modes is the fact that waterborne commerce must continue to play an ever-increasing role. Multimodal transportation planning should not be considered just in relation to urban development—the role of waterways in population redistribution must also be emphasized. Similar to highways, the waterways have opened formerly isolated areas to initial commercial development. This ongoing industrial expansion is vital to maintaining economic growth. Thus, the quality of the Nation's overall water management program is critical to maintaining a viable economy and the improving quality of life. ■

MANAGING OUTDOOR RECREATION RESOURCES

by J. W. Shiner, Ph.D.

The "now" America is a leisure-centered society. Millions of Americans are turning to the out-of-doors in ever increasing numbers seeking a multitude of various recreation activities and experiences. The incidence of outdoor activity solely for recreational purposes has undergone a phenomenal growth during the past few years and is predicted to continue doing so.

In support of that opening statement, let me cite the Nationwide Outdoor Recreation Plan (NORP), which indicates that we can expect a 49 percent increase in outdoor recreation during the current period from 1965 to 1980 and a 142 percent jump by the year 2000. Such increases are bound to place larger demands on a shrinking resource base. While great emphasis, through programs supported by the Land and Water Conservation Fund, has been placed on the acquisition and development of land and water resources for recreation, little has been done to provide for operation and management of these areas—or those areas developed preceeding them.

The NORP studies found that 82 percent of the citizens they surveyed were satisfied with the areas they used for outdoor recreation. Of this number, however, 29 percent signified this satisfaction was dependent upon the quality of the resource base supporting their recreational activity or experience. Thus, deterioration in the quality of the resource base seriously affects the recreational value attributable to an area and, hence, the quality of the recreational experience.

As demands on our resources continue to escalate—for a variety of uses—competition and conflicts are inevitable. For instance, do we run the ecological risk and drill for oil off the East Coast? Do we allow strip mining for coal within the primary watershed feeding a major recreational lake? Do we dam a stream to control flooding downstream and destroy prime trout waters? Do we continue a national "no land use policy" policy while land abuse and misuse runs amuck? Do we continue resource chaos and confusion or create a planned resources management system to mediate or eliminate resource conflicts?

Outdoor recreation is, of course, only one of the societal needs dependent upon our resource base. It is, however, the resource use that tends to be shoved aside as we go through the decison-making process of determining the relative values of the various potential uses for our resource areas. Outdoor recreation, a basically nonconsumptive form of resource use, does not have the "clout" of those uses having a more easily definable economic value. Mining, timber production, community development, transportation, and a host of other possible uses often assume a higher priority than outdoor recreation. It is therefore extremely important that three steps be taken to insure a reasonably stable resource base for outdoor recreation:

- We must implement a system of resource analysis to identify the primary land use potentials, based on both physical and social factors, and establish zoning to guide proper use.
- We must stand firm against the issuance of zoning variances and the encroachment upon lands zoned primarily for outdoor recreation.
- We must establish effective resource management within these areas to assure maintenance or creation of a quality recreation environment.

Resource Classification

The natural environment provides the resource base for numerous forms of recreational activities and experiences. Many forms are directly dependent upon the environment while others require it in only a secondary or supportive role. The cultural environment is likewise involved. Since recreation resources are those segments of the natural and cultural environment that support recreational opportunities, recreation resources may then be classified as either *natural* or *cultural.*

Natural recreation resources may be wholly or quasi-natural in origin. They include:

aerial resources—wind, precipitation, clouds, etc. that support a growing array of recreational activities;

aquatic-marine resources—fresh and salt water areas and their inhabitants;

terrestrial resources—land areas and inhabitants.

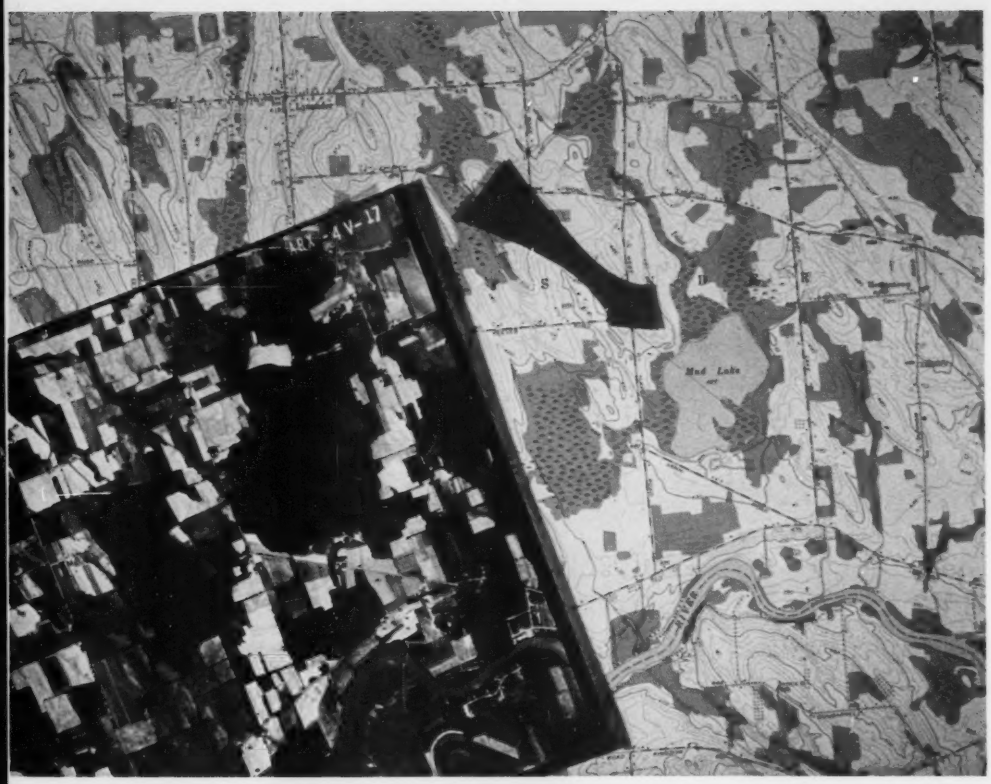
Cultural recreation resources consist of the works and imagery of man. These, too, may be divided into three classes:

historical-archeological—resources that reflect man's past;

Dr. Shiner is professor and chairman, Department of Recreation, Slippery Rock State College, Slippery Rock, Pa.

Predictions on America's outdoor recreation activities foretell a continuing escalation in this use of our natural resources.

Competing uses of our potential recreation resources include strip mining.



A system of resource analysis should be implemented to identify the primary land use potentials of given sites.

aesthetic-philosophic resources—consisting of a combination of natural and/or cultural resources resulting in positive mental imagery due to man's desire for beauty, naturalness, solitude and adventure;

physical resources—combination of proximate resources called parks, reserves, forests, reservoir projects, wilderness areas and other such designations.

All of us are accustomed to thinking of recreation resources as water, soil, vegetation, wildlife, etc. as they fit into the aforementioned classifications. Allow me for a few moments to redirect your thinking about these resources in relation to their relative permanence. In this regard, there are three other categories of recreation resources: *ephemeral, transient,* and *durable.*

Ephemeral resources are those present for a fleeting moment. Cloud forms, sunsets and the erratic flight of a swallowtail butterfly are examples. These, and literally billions of other short lived phenomena, form a significant part of the recreation resource base.

Transient resources are longer lived, but still temporary. Snow cover, wildflowers, fall colors and migratory waterfowl are examples.

Durable resources, on the other hand, exhibit an element of permanence. The degree of durability varies, but these are those resources the recreationist may expect to find visit after visit in an essentially similar state. Woodlands, a reservoir, a picnic area and other such resources are examples.

Develop a Philosophy

While there are some management considerations involved, the manner through which one classifies recreation resources is not as important as how one welds these resources into a unified whole to provide the variety of quality recreation experiences sought by the recreationist.

The traditional view of the outdoor environment involves two attitudes—it is *beautiful* and it is *useful.* These two oft conflicting concepts can, however, form a mutually supportive covenant governing the use and enjoyment of the outdoors. Unfortunately, we frequently find one of these concepts exploited to the detriment of the other. This results in vast acreages of over-used or under-used resources, even though most forms of outdoor recreation can take place together when the resource base is managed to achieve multiple use.

Prior to discussing various management strategies, it is necessary to develop a philosophical framework to guide the decision-making process. The various philosophies relative to outdoor recreation—those relating to leisure, recreation, and resources management—must be woven together as intricately as the woolen strands of a Navaho blanket. An outdoor recreation philosophy should be a synthesis of many concepts. It should have a special coherency which allows each concept its full

Exploitation of natural resources pollutes nearby streams where adequate safeguards are ignored.

measure of consideration while mediating conflicts of interest. While the full scope of such a philosophy is beyond the limits of this article, five theses will serve as its framework.

First, Man has been endowed by his creator with certain abilities and qualities that have made it possible for him to assume a limited dominance over the Earth. This dominance, however, takes place within the canon of natural laws. As long as Man operates within this canon, he lives in harmony with his environment. When he attempts to defy or circumvent one or more of these laws, the environment forces a redress—often exacting a terrible penalty in the process. Many of the ills currently besieging Man's society find their roots in Man's past attempts to disregard these natural laws.

Second, Man has certain needs, one of these being the opportunity to refresh and re-create his existence. This is accomplished through the process called recreation. Man feels a curious attraction to the outdoor environment and attempts to satisfy it through recreational contacts.

Third, Man's exploitation of natural resources for economic gain has created numerous environmental problems. The denial of access to resources for recreational use is a primary result of environmental pollution. Those who receive an economic benefit from the extraction or use of a resource must assume the responsibility to refrain from indiscriminate resource destruction, to exercise prudence in their operations, and create or renew the resource's usefulness for the public good.

Fourth, Man's descent upon the outdoor environment for recreational purposes has often been as destructive as his economic assault. Much of this destruction, misuse, and abuse is due to ignorance. Man has been poorly prepared to utilize the out-of-doors for recreation. Educational programs in environmental and leisure education—at all levels of formal and informal education—are a necessity if outdoor resources are to survive the recreational onslaught.

Fifth, the patterns of outdoor recreation are tied to societal changes and technological innovation. In order to accommodate shifts in outdoor recreation emphasis, a broad interdisciplinary, but flexible, outlook must pervade the thinking and actions of those who manage the resource base. We must have the innate capability to quickly "pull up the slack in one direction while feeding more line in another." The increasing emphasis on outdoor recreation will force changes in resource management policies and practices. Resource management of all kinds must accommodate an added dimension—the human animal.

Natural recreation resources encompass those of an aerial, aquatic-marine and terrestrial nature.

The Future Is Change

Over the past few years, a great amount of research has gone into the identification of the issues, problems, and challenges we will face in the future. We are all familiar with the societal phenomena which Alvin Toffler called *future shock*—that change is taking place so rapidly around us that we are unable to cope with it. Certainly, change is occurring at an ever increasing rate and we are finding it more difficult to keep up with every day. (Perhaps the release from change provided by recreation will be our salvation.) In an effort to identify some of the changes we can expect in the years ahead that bear directly on recreation resources management, the Northeastern Forest Experiment Station conducted a study utilizing the Delphi method to identify the changes and predict when they would come about. The complete study is available from the station, but let me summarize a few of the predictions of the Delphi panel:

By the year *1980* the experts who made up the panel predicted that different recreation activities would be allocated specific time periods for the same recreation area, that cans and glass containers would be banned from all recreation areas, that off-road vehicles would face severe restrictions in recreation areas and that interpretation of natural and historical resources would be available at most areas.

By *1985* noise levels will be enforced, recreationists will accept restrictive management procedures, cable TV will be available in most campgrounds and wilderness will be rationed.

The year *1990* will bring a Federal permit for salt water fishing, the establishment of assigned carrying capacities for recreation areas, year-round skiing on artificial surfaces, management systems involving wear resistant footpaths, electronic guide systems and other such innovations to allow increased use with minimum impact. Further into the future, these developments are likely to occur:

remote sensing devices to monitor park use—*2000*
certification of wilderness users—*2000*
waste disposal bacteria used to replace sewage treatment systems—*2000*
resource areas lighted to provide 24-hour use—*2000*
manmade islands created for recreation—*2000*
rivers constructed to accommodate recreation—*2050*

Many feel the predictions made in this study are much too conservative. They feel many of the changes predicted will come about much sooner than shown in

The manner of classification is not as important as the synthesis of diverse concepts into a philosophy of outdoor recreation.

Recreation resources may be classified as ephemeral, transient or durable, according to their relative permanence.

the study. In any event, they pose many challenges for the recreation resources manager.

An Emerging Profession

Recreation resources management is, in reality, an emerging profession. In the past, the resources supporting recreation were usually managed in relation to their basic economic needs. Forest lands were managed commercially for timber and pulp production. Wildlife was managed to produce game animals. Water was managed for flood control or low-flow augmentation, or any of a number of other economic-based uses. Recreation was, if considered at all, of secondary importance. Park management was, and in many respects remains today, simply facility development and maintenance.

Recreation resources management, on the other hand, involves the management of all these resources with recreation as a central focus. Thus, forests are managed to enhance their recreational values and the numerous species of nongame animals are managed as well as the game species. Water management, when recreation becomes its focus, also turns into a very different situation. Recreation resources management, in other words, is a new game. It involves new concepts—new ways of doing things—new approaches to the solution of many age old problems and a few new ones.

Recreation resources management must develop a strategy enabling it to flexibly fit within the philosophic framework previously developed and the mechanisms to provide for the special needs of both the resources involved and the users. While local strategies must necessarily vary, an overall strategy of recreation resources management must involve seven elements.

First, the strategy must provide mechanisms to accommodate increasing use of the resource base while protecting it from overuse and abuse. This element has long been a precept of our national park system and has, perhaps, been the most difficult to implement. Additional use may be absorbed by providing access to additional areas, by implementing time-zoning, or by "hardening" the resource base. Other alternatives may provide a more sensible approach on specific sites. All recreation areas will experience increased use in the years ahead. Planning to absorb and manage it is essential.

Second, we should begin to plan for the introduction of new recreation forms. What are the current policies in regards to new aerial forms of recreation such as sky-diving, para-sailing and hang-gliding? How should we handle flying platforms and hovercraft? These are only a few of the new recreation forms we will have to cope with in the not to distant future. In reference to the time allocation prediction mentioned previously, it may be necessary to establish certain periods when power boats can be used and other periods when only non-motorized craft are allowed. A number of other such measures may be necessary to keep ahead of, and guide, demand and use in the future.

One word of caution here— we cannot hope to adequately meet all the demands made by visitors at any one site. Our strategy must provide for the exercise of rational control over recreational use based on equity, carrying capacity, and resource use compatibility. An awareness of the recreation opportunities available within a region will enable us to establish a referral service to direct visitors to other, more appropriate areas for those who want something more, less, or different.

Third, our strategy must anticipate an *immediate* increased demand for areas and facilities to support the more basic and less expensive forms of outdoor recreation. Canoeing, backpacking, cycling, cross-country skiing and similar activities are growing steadily in popularity. These forms require little in facility needs, are nonpolluting, and provide a physical exercise component frequently absent in many other forms of recrea-

These youthful recreationists represent the challenge of the future for the recreation resource manager.

tion. Our strategy should place emphasis on the provision of facilities and services required to encourage these recreational pursuits. In terms of dollars and "sense," we all might be better off if these recreational forms were supported and encouraged. Increased emphasis on development and management for these activities is essential.

Fourth, our strategy must be sufficiently flexible to allow local managers the capability to modify policy to meet resource management needs. A policy allowing visitors a wide latitude in their recreational use of resources is, I believe, a good policy. It does, however, create many problems. It is evident that overuse and abuse of many recreation areas has occurred, thereby creating the need for some restrictions in use. To date, however, action in this regard has usually been in response to a critical situation that developed as a result of negative impact caused by the overuse or abuse. It is essential that local managers monitor the use currently associated with recreation resources to identify existing and *potential* resource problems. Modifications of policy or management should be implemented to alter or prevent inappropriate use—either on a temporary or permanent basis.

Fifth, our strategy should provide greatly increased efforts in interpretation. The interpretive system employed should include not only that necessary to interpret the natural and cultural history of the immediate area, but also the role of recreation and resources management. No aspect of our strategy is more important, for interpretation is the key to outdoor recreation sanity.

Sixth, our strategy should encourage the use of recreation areas for environmental and leisure education. Where such a resource base exists, it should be used to encourage local schools, youth organizations and outdoor clubs to make use of these areas for educational purposes. Local managers should select and, if possible, develop environmental study areas at appropriate sites or assist in the cooperative development of an environmental and leisure study center. The center may be day-use or even a resident facility, and could double as a visitor interpretive center. Promoting instruction in outdoor skills and the development of facilities to support them will provide the opportunity for visitors to learn how to recreate and properly use the resources managed for their use. In time, we will have fewer problems of misuse and abuse.

And last, our strategy should provide mechanisms to encourage innovative thinking about the resource base and its potential use. A little brainstorming may produce many ideas that, if implemented, could provide a quality not previously present. For example, maybe a given site is suitable for the location of a composting station that could be used by nearby communities—or a recycling center. Why not sell wholesome food such as fruit rather that candy and pop in vending machines? Developing similar ideas to make our recreation areas vital and viable forces for environmental management serve not only the local area but the Nation as a whole.

While these seven elements do not make a recreation resource management strategy, they can initiate the process of developing a comprehensive national strategy to meet the future outdoor recreation needs of all Americans—the needs of a growing leisure-centered society. ■

THE BOATING EDUCATION OF AMERICA

by Sally Irish Bennett and John C. Bernhartsen

Those who teach a boating America to practice the rules of the road for water and safe boating techniques recognize neither seasons nor shorelines as boundaries. Increasing numbers of manmade lakes and navigable waterways are making the pleasures of recreational boating accessible to more Americans with each passing year. The need for boating guidance has become a year-round program for the entire country.

With the uniform, flashing light and siren, the boating safety officer has the trappings of a waterborne traffic officer, but his purpose goes far beyond writing tickets for boating violations. An active duty member of the U.S. Coast Guard, this boating safety officer is specially trained to do two things: examine recreational boats for compliance with Federal boating regulations and prevent practices that may endanger life or limb, or damage property.

Cooperation is the key to everything the boating safety officer does to achieve the safety afloat of approximately 48 million American boat operators. Since only 214 such officers are assigned these duties within the Coast Guard, the task would be impossible without the cooperation of State and local officials, other Federal agencies and the boating industry itself. It is a system of shared responsibility, the extent of sharing dependent on whether the Coast Guard or some other entity has the actual enforcement jurisdiction on a given body of water—generally a natural or manmade lake. If the Coast Guard has jurisdiction, its boarding officers are authorized to work alongside the State and local officials in maintaining boating safety on those particular waters. If the Coast Guard does not have jurisdiction, the enforcement responsibility lies solely with some State or local department or another Federal agency such as the National Park Service, Forest Service or Corps of Engineers. In either case, the Coast Guard's job remains a big one: overseeing the boating public's education by conducting, assisting or simply monitoring all national programs.

Mrs. Bennett is a writer-editor and Mr. Bernhartsen is an education specialist in the Office of Boating Safety, U.S. Coast Guard.

Enforcement

In areas where the Coast Guard has enforcement jurisdiction, education becomes an integral part of enforcement. Boating safety officers are grouped into Boating Safety Teams (BOSTEAMS) responsible for Coast Guard boating safety activities within a Coast Guard district. The BOSTEAMS are divided into Boating Safety Detachments (BOSDETS) responsible for a cer-

The Coast Guard shares responsibility for the boating public's safety with State and local boating officers.

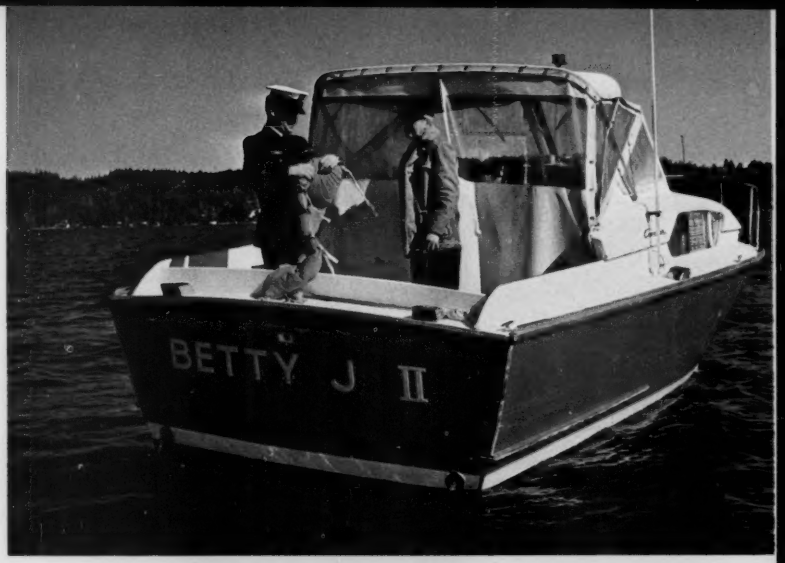
tain geographic area. Each BOSDET is composed of Coast Guard boating safety officers that are seen patrolling recreational waters.

At the National Boating Safety School in Yorktown, Va., Coast Guardsmen are trained to examine recreational boats for compliance with Federal boating regulations. While attendance at this school is not mandatory, most do attend, as well as many State and local officials. Although citing a boater for a violation is part of the job, the primary responsibility is to educate the boater. Any contact with the public is the boating safety officer's chance to give the boater information that may prevent an accident.

For example, an officer may stop a boat for displaying its numbers incorrectly. Although the offense itself is not a serious one, or even safety-related, it is a breach of law, and the boater should understand why the law exists. As part of his job, the boating safety officer will explain the purposes of numbering to the boater: to help prevent theft, to identify the boat in search and rescue cases, and to identify the boat in property damage cases. By explaining how laws are designed to protect the boater himself, the boating officer can help the boater accept laws more agreeably.

Once the boating officer has the boater's attention, the officer will also examine the boat's equipment, explaining each item as he goes along. Fire extinguishers, for example, must be the right size for the boat, in serviceable condition, and ready for use. Personal flotation devices (PFD's)—a new name for life preservers—must be in good condition, of the proper type for the boat, and of sufficient quantity for the people on board. As the boating safety officer examines the equipment, he looks for flaws that could prove fatal. If, in the process, he finds something wrong, he will try to help the boater correct the problem. Boating safety officers have been known to assist boat operators in repairing leaking fuel lines, tightening loosely installed flame arrestors, and replacing fuses in electrical systems to repair inoperative navigation lights.

If the condition is especially hazardous and cannot be corrected at once—fuel in the bilge is an example of



Right—Boater watches as boating safety officer demonstrates proper inspection of personal flotation device.

Center—The flame arrestor is checked to make sure it will contain backfires that could ignite engine compartment fuel vapors.

Bottom—The boating officer prepares a report of boarding, listing safety equipment examined.

such a condition—he would require the boater to return to a mooring to correct the problem. In this case, the boating safety officer would remove the occupants and tow the recreational boat to prevent a possible explosion. Stopping the individual's boating is always a last resort. The safety officer will first make every effort to help the boater continue his recreation safely and, if possible, without a citation.

A routine boarding examination may last 5 minutes or 40, depending on the size of the boat and the condition of the equipment. Although the boater may be inconvenienced, he gains in two ways: he will have both a thoroughly examined boat and an awareness of boating safety. Whether or not a boarding results in a citation, the boat operator will be one step closer to correcting situations that could possibly kill him and destroy his boat.

Those who prefer can take advantage of an alternative safety service that is offered by the Coast Guard Auxiliary. Boaters who contact the Auxiliary may have a courtesy motorboat examination (CME), either before casting off or after getting underway. There are three advantages to obtaining a CME. First, once a boat passes, the CME decal alerts the BOSDET that the boat has proper equipment and the operator is aware of Federal boating requirements. Second, a boater who requests the Auxiliary examination does not receive a citation if he fails to pass. He simply makes the necessary corrections and returns for reexamination. Third, the CME is even more demanding since Auxiliary standards require more safety equipment on board than the BOSDET's examination does.

Cooperative Training

Because many State and local boating officials also attend the National Boating Safety School, the methods they use are often the same as those of the Coast Guard. If they cannot attend the school, they may attend one of the 32-hour courses taught in the Coast Guard districts by BOSDET members. In either case, the bond of common education and experience encourages a geniality and camaraderie among Coast Guard, State and local officials. Other Federal agency officials involved in boating tasks also work with the Coast Guard in order to gain the knowledge and skills necessary to perform their own on-the-water tasks. At the Great Smoky Mountains National Park in Gatlinburg, Tenn., a Coast Guard boating safety officer has helped conduct on-the-water training for park rangers. In addition, each ranger must take the Coast Guard's public education correspondence course, *The Skipper's Course,* to become a licensed boat operator.

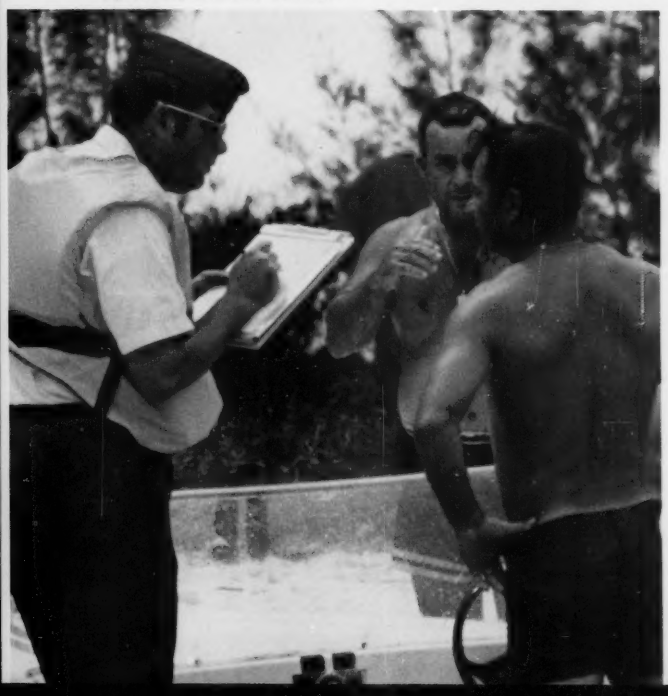
National Park Service rangers operating out of Floyd Bennett Field in New York City's borough of Brooklyn have gone even further in their training programs. After completing *The Skipper's Course,* they enroll in the *BOSAF Course,* a correspondence type of curriculum developed primarily for Coast Guard boating safety officers, and then follow up with the district level 32-hour course presented as reinforcement training.

The U.S. Geological Survey office in Austin, Tex., also uses *The Skipper's Course,* supported by additional training from an experienced boater, for the education of its water quality technicians.

Public Contacts

Because of its broad responsibility and the large number of boat operators, the Coast Guard must depend on group education programs. The job isn't easy. During the off season, BOSDET members may be away from home four nights out of seven, selling boating safety like old-fashioned medicine vendors peddling their

Boarding a boat often is a test of the boating safety officer's diplomacy and self-control.



A boat that passes the more detailed Courtesy Motorboat Examination provided by the Coast Guard Auxiliary more than meets the minimum Federal boating equipment requirements.

Coast Guard Auxiliary classroom courses combine wisdom of an experienced instructor with student fellowship.

wares. They go everywhere: boat shows, special events, meetings of public groups and civic organizations, dealers, local media.

At boat shows the Coast Guard sets up its booth right next to boat manufacturers, although boating safety education is not as easy to sell as shiny new boats. Until recently, the only sales tools were a display booth and a sound-slide coordinated cassette. Now, however, the Coast Guard has available an actual boat in cross section. This new "half-boat" display shows both required and recommended safety systems and equipment. The most effective tool at any boat show still remains the boating safety officer and his professional knowledge of boating safety. For many boaters, a boat show is their only chance to ask questions of a Coast Guard officer. Despite competition from the boat displays, the Coast Guard can reach more boaters at a show than on the water. In addition to boat shows, special events offer an excellent chance to contact boaters in a receptive mood. Holiday picnics, parades and recreation shows at shopping centers allow boarding officers to become known as educators rather than enforcers. Once in a while, boating safety officers become local celebrities. Especially in larger districts, public speaking assignments may take on the look of a tour. Some officers even develop a number of their own *shows*: the PFD show, the fire extinguisher show, the emergency repairs show.

Marine dealers are another public contact, because the dealer can, in many instances, provide the boater's first taste of boating knowledge. Therefore, a properly informed dealer can help the boater both equip his boat and comply with boating laws.

Despite all these efforts to reach boaters personally, many are still missed. Media exposure has become another method of contacting those who would not otherwise be aware of boating safety. Occasionally, boating safety officers have been guests on television shows or have had regular radio programs of their own.

In addition to traditional public contacts, seven districts will be using a mobile information center by late 1975. Manned by either one or two Coast Guard officers and sometimes by State marine enforcement officers, this van will move continually from one recreation location to another during the boating season. During the day the officers on duty will distribute boating literature, inspect equipment and talk with visitors. In the evening, the officers will present boating films for adults and may also show cartoons for the children. As many as 15 of these information centers will be traveling throughout the country.

Personal Study

Several study courses are available for individuals interested in learning more about boating safey. ***The Skipper's Course*** mentioned earlier is convenient for home study. ***The SOS Course*** is a slide presentation intended for group use. The boater may also contact the Coast Guard Auxiliary, a civilian component with over 43,000 volunteers, whose instructors teach a variety of courses ranging from the basic one-lesson ***Skipper's Outboard Special*** and three-lesson ***Basic Boating*** to the more extensive seven-lesson ***Principles of Sailing*** and the 6- to 13-lesson ***Boating Skills and Seamanship***. The Auxiliary, in addition, offers a selection of one-lesson specials such as the ***First Aid for Boatmen*** course developed in cooperation with the American Red Cross.

The latter has its own inventory of water safety courses covering a range of diverse subjects from SCUBA diving to sailing. The U.S. Power Squadron, a private boating organization, also provides boating courses. Besides the benefit of being taught by an experienced instructor, these courses initiate a useful

The "half-boat" numerically displays the on-board safety equipment required by Federal law or recommended by the Coast Guard.

Federal assistance allows students from Universities of Tulsa and Houston to learn how to teach boating safety in public schools.

exchange of knowledge among fellow boaters—probably the best educational tool of all.

Educational Assistance

With over 8 million motorboats, more than 17 million operators, and over 48 million people who boat, the BOSDET force of 214 men cannot hope to meet the task of educating the country's recreational boaters without help.

In 1971, Congress passed a Federal Boat Safety Act that, among other provisions, made financial assistance available to States and nonprofit organizations to improve their boating programs. This can be done either through the addition of equipment and personnel, through the training of their own boating officers, or through the development of their own public education programs.

Among the nonprofit organizations awarded grants for boating safety projects is the American Alliance for Health, Physical Education and Recreation (AAHPER), which has contracted with the Universities of Houston and Tulsa to develop a curriculum to train professional teachers to instruct boating. This pilot project is to be developed in three phases. Phase I, now nearing completion, is to develop a college level curriculum which will prepare secondary school teachers to teach boating safety. Phase II, which started this past summer, will test and evaluate the curriculum by observing those who completed the curriculum actually apply the teaching of boating safety at several high schools. Phase III, which will follow the field testing and possible modification of the college level program, will be a workshop for college teachers who want to introduce boating safety into their own colleges.

An integral part of this program is to develop a teaching model which will specify the skills and knowledge secondary school teachers should have in order to teach boating. Teachers completing the program will receive a certificate based on specific requirements the alliance will recommend to each State as a model to use in establishing its own certification requirements.

Besides nonprofit organizations like the American Alliance, the Coast Guard helps industries in their employee boating safety programs. Sometimes a boating safety officer conducts a company's program, other times he only provides the teaching materials. In the past, companies as diverse as breweries and insurance companies have also developed their own education materials as part of company advertising programs. Some insurance companies, for instance, have helped promote boating safety education by offering a discount to boaters who either complete a boating course or receive an Auxiliary CME.

The goal of Coast Guard boating safety officers—whether they be examining boats or lecturing boy scouts—is to encourage the public to enjoy boating in a safe manner.

Realizing the mutual attainment of boating enjoyment and safety can be most easily accomplished when the public willingly cooperates, the Coast Guard stresses education over enforcement. In suggesting the first public contact policy for the Revenue Marines Service (the Coast Guard's predecessor), Alexander Hamilton declared:

"They will always keep in mind that their countrymen are freemen, and, as such, are impatient of everything that bears the least mark of domineering spirit."

In cooperation with other boating safety officials, Coast Guard officers constantly strive to live up to Hamilton's standard by educating whenever possible and enforcing only when necessary. ■

ARTIFICIAL ISLANDS FOR INDUSTRIAL PORTS

by Joseph Bonasia

Recent problems encountered by this country's electric-generating and oil refining industries in obtaining plant sites in coastal regions have affected programs designed to increase the capability of these industries to satisfy future demands. One of the options being explored is construction of offshore ports.

National demand for refined petroleum, electric power and other forms of energy is at record levels. Many States, however, have passed environmentally oriented restrictive legislation that casts serious doubt on American industry's ability to satisfy that demand in future years. This dilemma prompted the National Science Foundation's Research Applied to National Needs (RANN) program to fund a comprehensive study to evaluate the economic, engineering, legal and environmental feasibility of constructing large, artificial islands off the Atlantic and Gulf Coasts to serve as industrial ports for international commerce.

The study, entitled "An Evaluation of Multi-Purpose Industrial-Port Islands" was initiated in the spring of 1974. Recently completed, the study concluded that it is indeed feasible to construct manmade, sand-filled islands on the Atlantic and Gulf Continental Shelves.

Mr. Bonasia is the principal engineer for the consulting engineers firm of Frederic R. Harris, Inc. of Great Neck, N.Y.

Four participating organizations provided the component factor evaluations that supported the overall study conclusions. The College of Marine Studies at the University of Delaware was responsible for project management, system analysis and optimization, and analysis of the legal and environmental factors. Texas A&M University did the economic, social and market analysis. Gilbert Associates, Inc., of Reading, Pa., was responsible for studying industrial processes and plant technology, master planning, and providing plant installation and operation costs. My own firm, Frederic R. Harris, Inc., of Great Neck, N.Y., had responsibility for site selection, island construction methods, conceptual layout, access and the cost estimates for the candidate sites recommended.

The participating organizations contributed to the larger RANN sponsored study with four separate smaller studies, each of which contained conclusions relating to its respective area of concern.

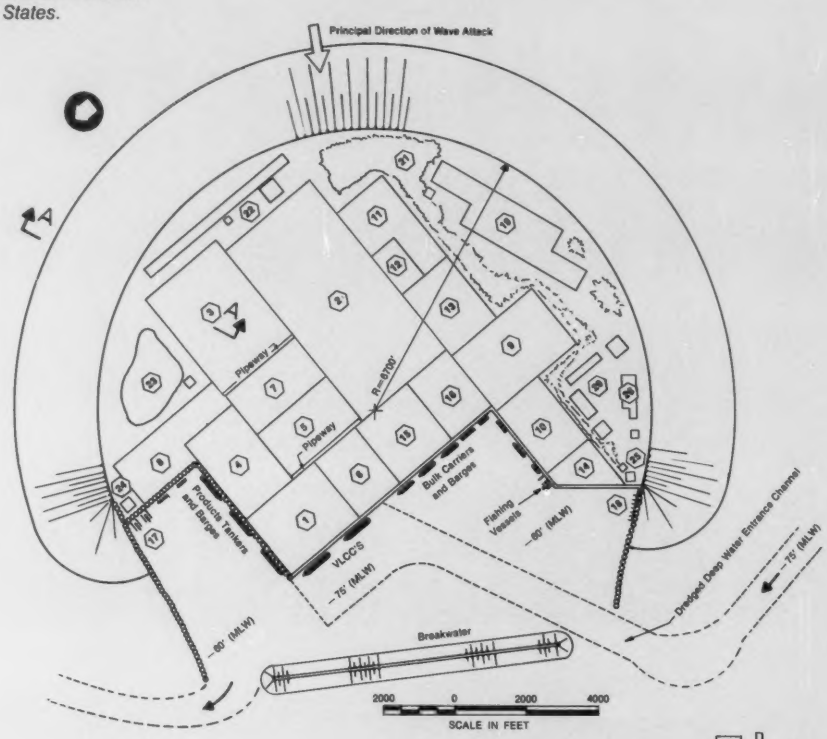
The Texas A&M report, "Market Demand and General Location Options," concluded that, under present circumstances, offshore multipurpose islands in the Middle Atlantic region must be designed for oil refineries first. Of the numerous industry sectors evaluated, oil refining has experienced the highest percentage of rejections in recent years in trying to obtain coastal plain sites.

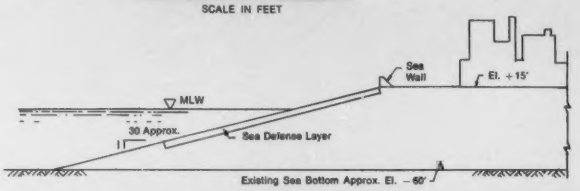
The objective of the Gilbert Associates report, "Process Description and Adaptive Study," was twofold: to quantitatively describe an example industrial complex

Candidate industries for artificial offshore ports share common problems of environment rejection by coastal States.

PROPOSED INDUSTRIAL/PORT ISLAND PLAN ALTERNATIVE NO. 1

1 Crude Oil Tankage
2 500,000 BBL/Day Refinery
3 Petrochemical
4 Fuel and Petrochemical Products Tankage
5 Acid Plant
6 Rock Storage
7 Ammonia and Urea Plant
8 Fertilizer Blending and Storage
9 Paper Plant
10 Wood or Craft Storage
11 Brine Processing Plant
12 Desalination Plant
13 Power and Steam Plants
14 Seafood Processing Plant
15 Municipal Waste Treatment Plant
16 Island Waste Treatment Plant
17 Tugs and Small Craft Harbor
18 Marina
19 Residential Area
20 Recreational and Cultural Area
21 Park
22 Airport and Heliport
23 Golf Course
24 Fire Protection
25 Mariculture and Marine Biology Station
26 Island Administration and Communications Center

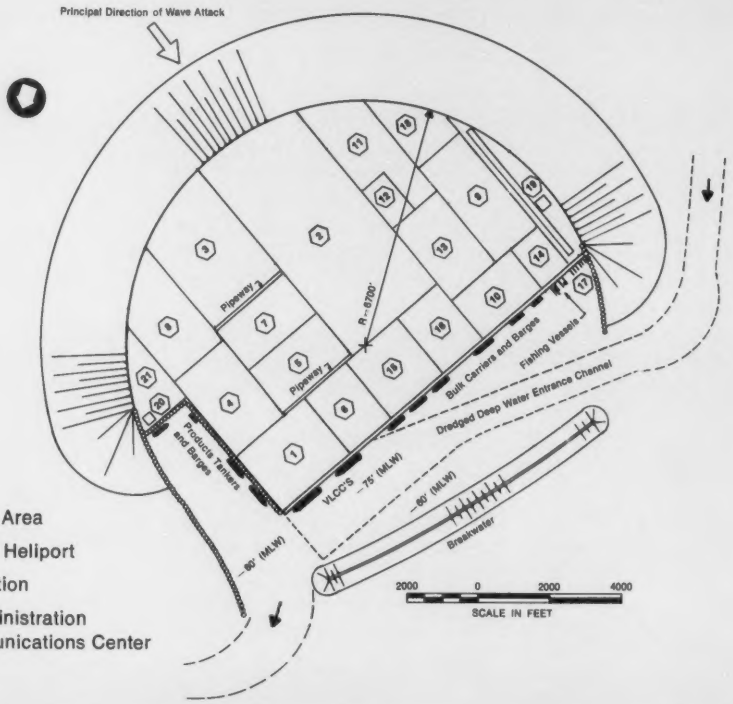




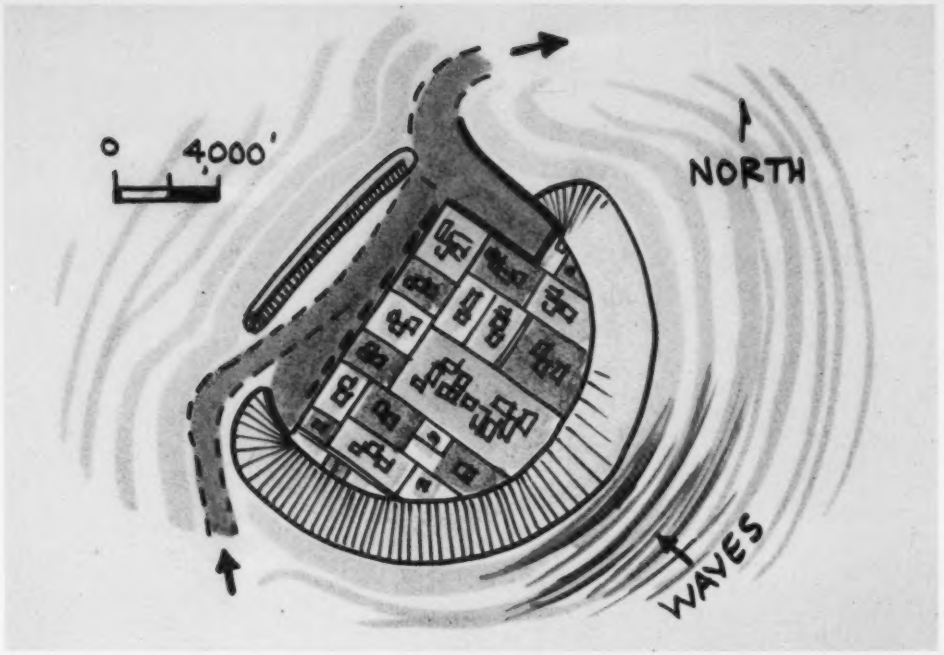
SECTION A-A
N.T.S.

PROPOSED INDUSTRIAL/PORT ISLAND PLAN ALTERNATIVE NO. 2

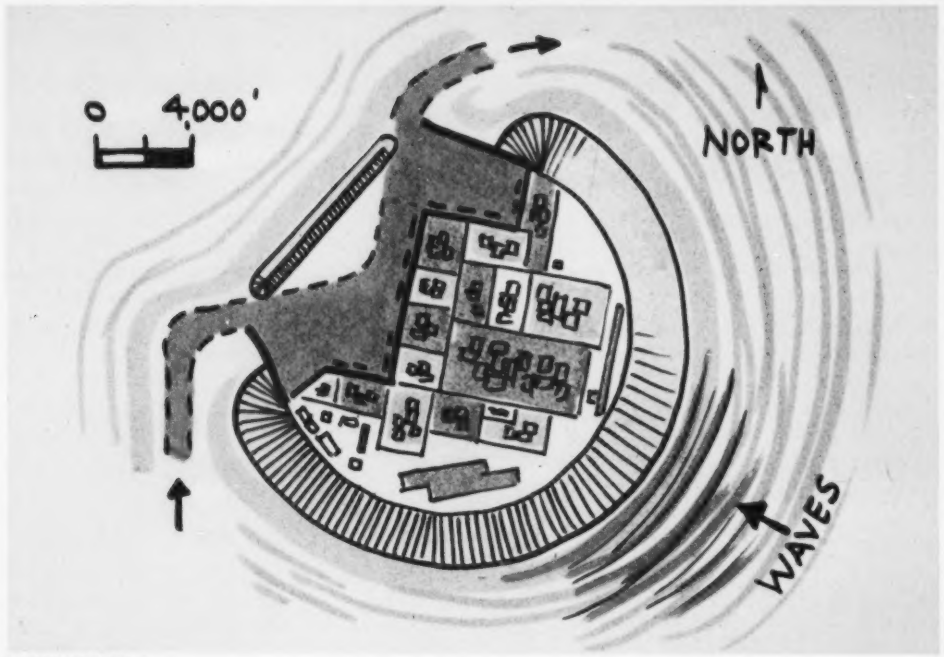
1 Crude Oil Tankage
2 500,000 BBL/Day Refinery
3 Petrochemical
4 Fuel & Petrochemical Products Tankage
5 Acid Plant
6 Rock Storage
7 Ammonia and Urea Plant
8 Fertilizer Blending and Storage
9 Paper Plant
10 Wood or Craft Storage
11 Brine Processing Plant
12 Desalination Plant
13 Power and Steam Plants
14 Seafood Processing Plant
15 Municipal Waste Treatment Plant
16 Island Waste Treatment Plant
17 Tugs and Small Craft Harbor
18 Residential Area
19 Airport and Heliport
20 Fire Protection
21 Island Administration and Communications Center



ALTERNATIVE NO. 1



Basic difference between both proposed layouts is larger acreage alloted to residential-recreational usage and small vessel anchorage in alternative 1 (opposite page, top). Circular configuration helps dissipate wave energy.



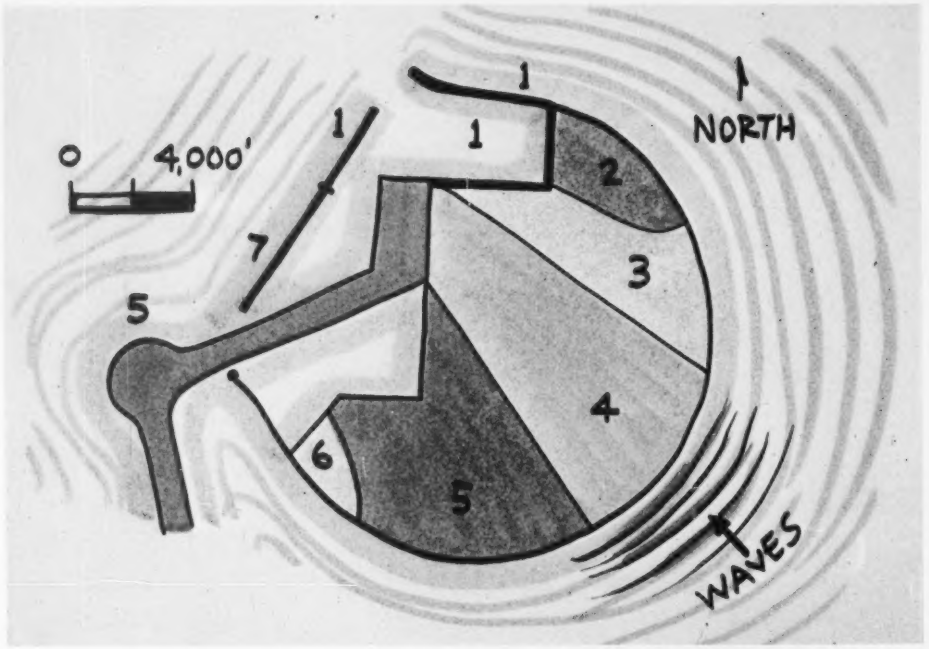
ALTERNATIVE NO. 2

and to investigate the concept of industry integration as a means of optimizing an offshore island as a site for the industry tenants.

The report on "Civil Engineering Considerations," completed by Frederic R. Harris, Inc., evaluated design and construction techniques for manmade, sand-filled islands, identified candidate sites, and developed the conceptual island layouts to support those industries selected by Texas A&M's market demand and Gilbert Associates' process description reports. Consideration was given to determining the requirements for island harbor facilities, ship access, shore-to-island access, island support facilities, sources of borrow material, and construction methods, costs and scheduling.

Identifying Candidate Sites

A reconnaissance type engineering survey of both the Atlantic and Gulf Coasts was conducted to identify island candidate sites. Based on the results of this survey, and supported by the conclusions reached in the "Market Demand and General Location Options" report, two candidate areas approximately 10 miles off the New Jersey and Virginia coasts were located. The



Seven-phase construction sequence for alternative 1 would be similar for second layout, but on smaller scale.

sites are considered suitable for the following reasons:

high probability of suitable foundation conditions
known nearby sources of sand
clear of shipping lanes and close to deep water
moderate tides and minimum currents
wave climate favorable to shipping operations
no known fault or slip planes
no known major seismic or tornado activity
no military or dumping constraints
no history of Great Hurricane crossings

Two alternative conceptual layouts were developed for each site in order to support the industrial complex generated in the "Process Description and Adaptive Study" and include the following candidate industries:

500,000 barrel a day crude oil refinery
petrochemical plant
acid plant
ammonia and urea plant
fertilizer plant
paper plant
brine processing plant
desalination plant
power and steam plant
seafood processing plant
municipal waste separation
island waste treatment plant

These primary candidate industries were cited because they have some of the following characteristics in common:

Limited compatibility with human residential and recreational activities, despite expensive pollution control and beauty treatment.

Energy resource-intensive and, therefore, considered an objectionable point source of heat rejected to the environment.

Feed stocks and/or products compatible with transportation by large ships.

The conceptual layouts differ in the amount of non-industrial amenities. Alternative 1 provides for substantial residential and recreational areas; alternative 2 provides only a limited residential area. Each layout provides for a 10-day storage of raw material arriving at the island—including crude oil, potash, phosphate rock, sulfur, wood and refuse. Storage is also provided for manufactured or refined products—including hydrocarbon liquids (fuel oil, gas, propane, etc.), polymer prill/chips, fertilizer salt, paper rolls and process frozen seafood. Harbor facilities include a deepwater channel approximately 1,000 feet wide and 75 feet deep for incoming, deep-draft very large crude carriers (VLCC) in the 250,000 dead weight tons (DWT) class.

The industrial requirements established for the island by Gilbert Associates are as follows:

Industry or Storage	Minimum Acreage
500,000 barrel a day crude oil refinery	430
crude oil tankage	110
petrochemical plant	185
fuel and petrochemical product tankage	100
acid plant	90
phosphate rock storage	70
ammonia and urea plant	100
fertilizer blending and storage	100
paper plant	135
wood or kraft storage	75
brine processing plant	80
desalination plant	25
power and steam plant	90
seafood processing plant	50
municipal waste treatment	90
island waste treatment plant	70
Total	1,800

Movement Onto Island

RAW MATERIAL	QUANTITY-TONS PER DAY
crude oil	85,000
potash	2,650
phosphate rock	13,000
sulfur	1,500
wood	300 (kraft) 420 (cords)
refuse	24,000

All other raw materials to be shipped by bulk carriers or barges.

Movement Off Island

PRODUCT	QUANTITY-TONS PER DAY
hydrocarbon liquids	75,000
polymer prill/chips	5,000
fertilizer (dry)	8,500
salt	230
paper rolls	285
processed frozen seafood	270

The key industry is petroleum refining and, therefore, the key input to the island is crude oil. The key outputs are refined petroleum products and petrochemicals. All other island industrial tenants are rational extensions of these industrial facilities, either as secondary processing, maintenance and operation support or disposal of wastes. For example, the acid plant uses sulfur recovered from the refining crude runs, sulfates extracted from brine, imported sulfur and phosphate rock, and ammonia from the fertilizer complex.

Conceptual Layout

The circle configuration used for both layouts limits the possibility of localized wave energy concentrations on any one part of the sea defense system. Refracted waves as well as waves generated by onshore winds are prevented from entering the harbor by a breakwater. Minimum oscillations and resonance can be expected. The island is oriented to the southeast, which is the direction of the principal wave attack along the East Coast. The harbor is also protected from northeast storms. In contrast to conventional sea defenses, this island can be constructed with a flat slope of approximately 30 to 1, which would permit use of sand and light armoring. It is quite possible that a significant cost saving could be realized compared to the cost of steeper slopes that require large-rock energy dissipaters.

Following is a comparison of the two layouts:

	Alternative 1	Alternative 2
Total area (acres)	3,000	2,000
Total area (square miles)	4.7	3.1
Radius (feet)	7,700	6,700
Industrial area (acres)	1,800	1,800
Living & support area (acres)	1,200	200
Wharfage (linear feet)	16,900	16,900
Volume of sand (cubic feet)	460×10^6	320×10^6

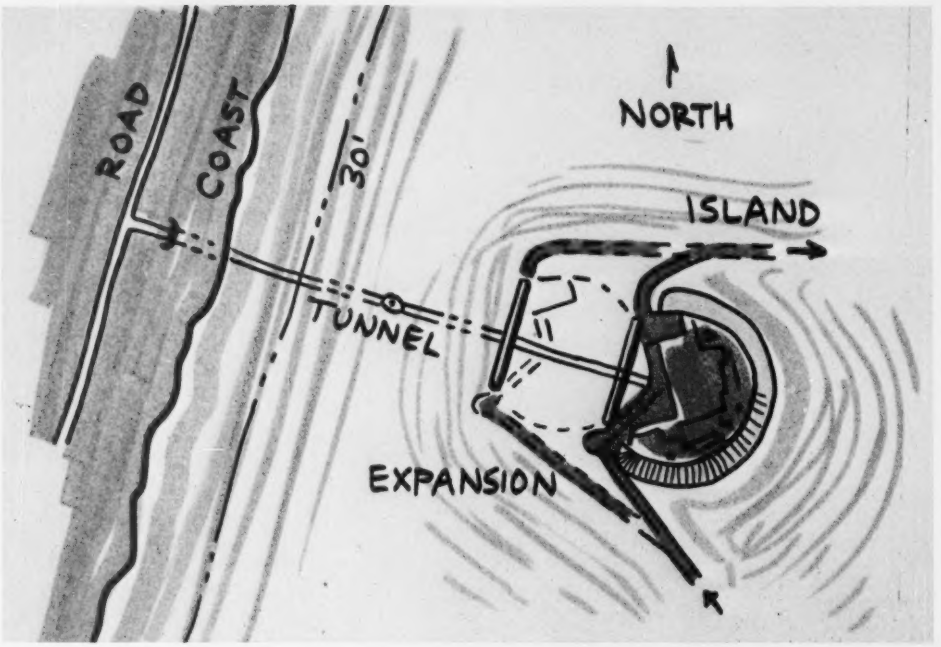
Alternative 1 assumes that the major portion of the three shifts, estimated at 1,550 men per shift, would live on the island with their families for extended periods of time. Therefore, substantial residential housing and recreational-cultural facilities—such as a golf course, marina, theater, school, etc.—would be necessary. Also, each layout would include an island administration and communication center.

The addition of future islands could expand the port complex toward or parallel to shore. Expanding toward shore would have the advantage of constructing the added island in the lee of the initial island, and therefore require minimum sea defenses. Adding the island parallel to shore would mean open sea construction, larger quantities of heavier sea defense material and higher cost. Furthermore, this layout could have greater impact on the normal coastal processes.

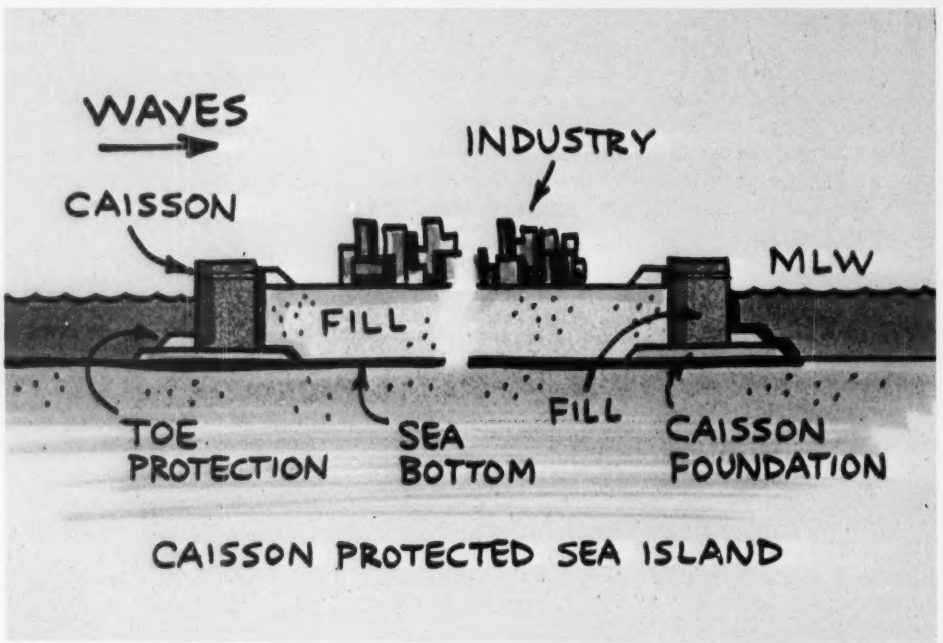
Primary access to and from the islands would be by vessels and/or a twin-tube vehicular tunnel used by trucks transporting shift personnel to and from shore. If the mode of expansion were to consist of adding one or more islands parallel to shore, then one tunnel terminal would serve all the linked islands. If expansion were to consist of adding any island toward shore, then provisions would be necessary during the initial construction phase for a turnoff to each of the future islands. Access might also be available by air through provisions of a heliport and an airport runway suitable for "executive" type jets.

Navigation and Harbor Facilities

A deepwater approach and entrance channel with a 75-foot depth at mean low water (MLW) for 250,000 DWT VLCC's and a 60-foot departure or exit channel



Adding shoreward islands would require incorporating provision for future turnoffs during initial construction of the optional twin-tube tunnel.



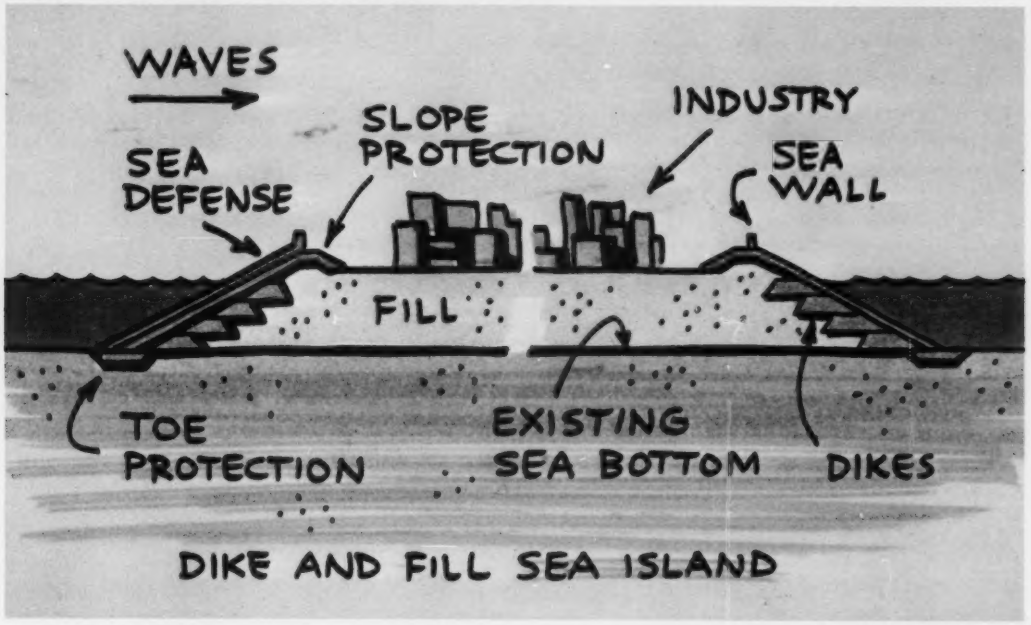
Onshore quarries would provide large stones for foundations and sea protection.

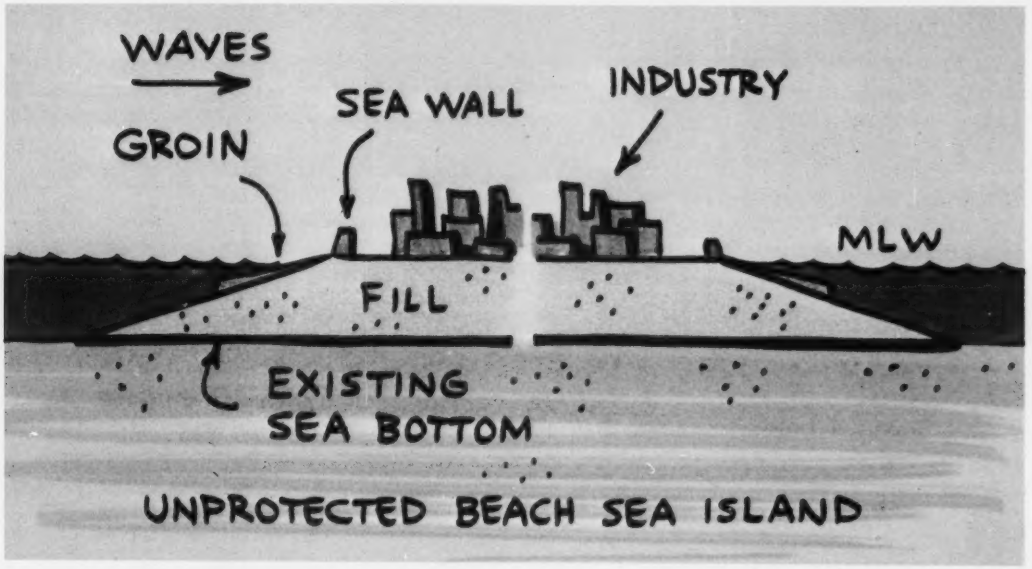
would be provided. Floating and fixed visual aids to navigation would mark the channel. Electronic aids to navigation (such as radar) would assist traffic control, especially during periods of low visibility. A marina for smaller vessels would be available in alternative 1, in addition to the tug and small craft harbor provided in both layouts.

For maximum safety of operations, all shipping would be one-way traffic to and from the island. Arriving vessels would transit the deepwater channel into the harbor; departing vessels would transit the exit channel to the open sea. VLCC's would leave the harbor directly without any turn-around maneuvers.

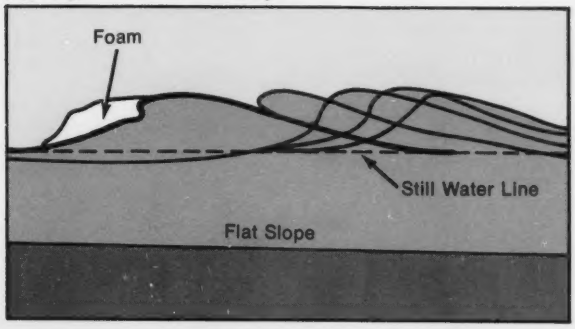
Approximately 16,900 linear feet of dock will be required, which would include provisions for two VLCC berths, three petroleum product shuttle tanker berths and facilities for loading and unloading bulk vessels and barges. The island facilities would be designed to incorporate all pollution prevention and control measures for each industry requiring such measures. Petroleum tankers, containing both crude and product, would be boomed during loading and discharge. In addition, con-

Flat slope sea defense merits evaluation as a lower cost construction alternative for withstanding open-sea wave action.

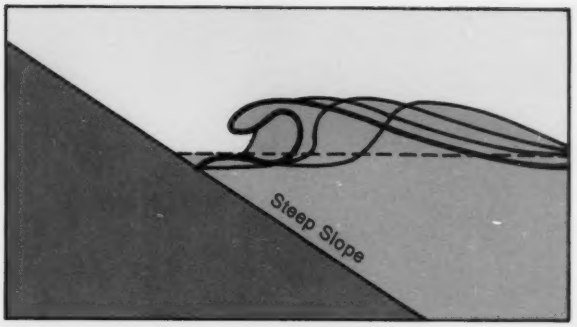




(Spilling) Breaker on Flat Slope



(Plunging) Breaker on Steep Slope



tingency plans could possibly provide for booming the harbor entrance and exit in the event of spill to prevent oil from escaping outside the harbor.

Construction

Construction of offshore, multipurpose industrial-port islands will require specialized equipment and advanced technology. However, extensive offshore oil exploration drilling and production construction experience can provide considerable information on waves, swells, winds, hurricanes, and their resulting forces on offshore structures and techniques for constructing similar structures in open and exposed waters. It goes without saying that any structure built offshore will be costly.

Storm shelter for construction equipment would be provided either at the site or at a protected inshore staging area. If the site happens to be located close to an existing harbor of refuge, there may be no need to provide storm protection at the site. If, on the other hand, the site is a considerable distance from a protected area, it may be necessary to provide a sheltered harbor at or near the site as rapidly as possible. This may be accomplished either by early installation of caissons or other prefabricated structures, which will later become permanent parts of the island, or by installing a temporary breakwater.

The island would be constructed in seven phases. As figure 1 shows, a harbor would be constructed during phase 1 by installing prefabricated caissons and a portion of the breakwater as shown. The resulting harbor would then provide an operating base as well as storm shelter for floating equipment. This is an important consideration, since it is estimated that it would take approximately 10 years to construct such an island.

Dredges will have to be used to excavate the tremendous amounts of sand required to make up the bulk of the artificial island. The type of dredge selected will depend on a number of factors including depth limitations, hauling distance, sea and weather conditions and construction sequence. However, since hydraulic dredges are relatively large volume excavators compared to mechanical types, the former will probably be the major type used. Hydraulic dredges employ the suction principle, drawing a mixture of soil and water from the sea bottom through centrifugal pumps.

The magnitudes of the volumes and the economics involved will require that the sand material needed to construct an offshore island be excavated from nearby areas in the sea bottom. Large deposits of sand suitable for island fill material—on the order of magnitude of 15,200 million cubic yards—are known to exist along the Atlantic Coast. The search to locate unexploited offshore deposits of sand along the Atlantic Coast was conducted by the U.S. Army Corps of Engineers' Coastal Engineering Research Center. No known similar study has taken place along the Gulf Coast. Formerly called the Sand Inventory Program, it is now referred to as the Inner Continental Shelf Sediment and Structure Program. The large stones used as armor protection, or as a base for the supporting caissons, would necessarily be obtained from onshore quarries and barged to the site.

Construction Costs

The estimated order of magnitude cost, at 1975 prices, to construct alternative 1 is $750 million and alternative 2 is $550 million. These costs include mobilization, dredging, rock protection, sand fill, deepwater channel dredging, caissons, breakwater and berthing facilities. The estimated order of magnitude cost to construct the optional 10-mile twin-tube vehicular tunnel is $200 million and includes two shore and one sea ventilation shafts. The offshore island concept is both challenging and promising as a future location for the industries described in this article. Removed from the normal land uses related to the pursuit of human habitation, recreation or environmental conservation practices, such an island could be structured to maximize use of its surrounding air and sea while remaining within the acceptable limits of its own environment. Artificial islands could become a viable solution in our search for acceptable locations of necessary industries in the environmentally sensitive coastal zones. ■

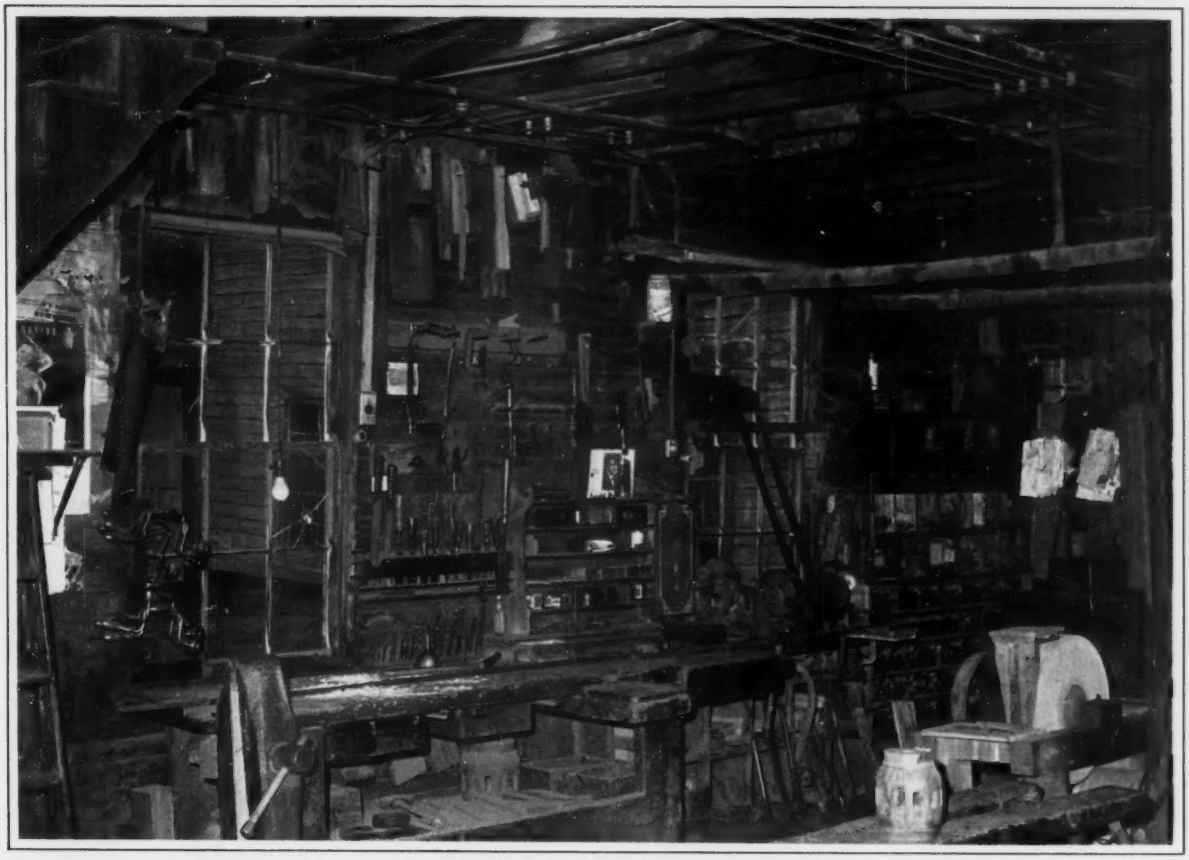
History Takes A Step Forward

by James Kahn

"Building Tomorrow Today" reads the metallic red and blue sign outside the construction office of the Corps of Engineers' Blue Marsh Lake project in southeastern Pennsylvania. Yet despite the slogan, project engineer Bob Jaggard often finds his time occupied by neither future nor present—but with the past.

His concern centers around an old building called the Gruber Wagon Works, an extraordinarily well preserved 19th century factory standing on land soon to be flooded by the planned manmade lake. Jaggard, with the backing of his district engineer, Col. C. A. Selleck, Jr., is determined to save this bit of living history for posterity.

Their desire to protect the Gruber works is in fact typical of a growing effort by the Corps to preserve historic structures and sites on Corps-owned lands throughout the United States. Army engineers are renovating dilapidated houses, carefully recording architectural details of buildings about to be demolished and setting up



Workbench area surrounded by numerous parts and tools will be recreated in identical setting at proposed park site for wagon works museum.

historical exhibits for the public.

Concern for the environment by Corps personnel encompasses social as well as natural resources. History, an integral part of the social fabric, has lately received additional importance with the approach of America's Bicentennial.

The upsurge in activity is not due to increased consciousness alone. Corps historical preservation efforts remained rather low key for many years because funds weren't authorized by Congress for this purpose. But with passage of the Moss-Bennett Act (Public Law 93-291) in May 1974, Federal agencies like the Corps are permitted to spend up to 1 percent of a project's appropriated funds for the survey and recovery of historical, archeological or paleontological material.

Before Moss-Bennett, Corps personnel could only apply small amounts of a project's construction or maintenance funds for such purposes. As a result, many historic buildings and archeological sites had to be demolished, inundated, or buried over the years because the Corps lacked money to save them. Robert M. Vogel, head of the Science and Technology Department at the Smithsonian Institution's National Museum of History and Technology, characterizes the Corps' former reputation in the field of historical preservation as "so rotten it had no way to go but up," though, lately "it's been ever so much better." However, Major General J. W. Morris, until recently the Corps' Director of Civil Works, feels that "the Corps' role has always been at a very high level. We've been very much concerned and have many examples to support the point." Moss-Bennett, according to General Morris, merely provided a "significant plus" with which to implement that concern.

The scope of preservation contemplated for the Gruber works even goes beyond Moss-Bennett's 1 percent expenditure ceiling. The Corps plans to dismantle the three-story frame building and move it to a nearby county park, where it will be reassembled and then operated as a public museum by local authorities. The entire project, including structural renovations to the aging building, will cost nearly $1 million and represents the largest preservation project the Corps has undertaken. Obtaining this amount of money will not be an easy task.

The historical significance of the Gruber Wagon Works makes the effort worthwhile. Built in 1882, this building exists today as perhaps the best example of a late-19th to early-20th century rural manufactory. The plant is completely intact, including machinery, tools, materials and a few examples of its primary product, the basic farm wagon. Coals still lie in the blacksmith's forge. Though no wagons have been produced here for years, it all looks as if the workers simply stepped out for lunch. A properly trained crew could walk into the factory and start making wagons tomorrow.

Commenting on the historical value of the structure, the Smithsonian's Vogel notes: "Extraordinary does not really quite say it. While there are a number of small 19th century factories in the United States that survive with their machinery and other equipment intact, I know of no other where this is true to the extent that it is at Gruber's . . . (It) is nothing less than a three-dimensional document of one particular American industry, fixed within a particular, narrow time frame."

That time frame does, however, accommodate a range of manufacturing processes. When they began production in the 1880s, Franklin H. Gruber and his four sons built wagons largely with hand tools—saws, axes, frows[1] and drills. What little power that was needed was provided by a horse-drawn turnstile and later a small water wheel. But their business quickly grew and the Grubers incorporated the new machinery of the era—power sanders, band saws and lathes—to speed up the process. When they weren't able to buy a machine they needed, the resourceful Grubers simply designed and built it themselves. They added a steam engine in 1896 to drive the new machinery via an overhead belt system. Ten years later all this was replaced by an Otto gasoline engine—a single 7-inch piston connected to a pair of 5-foot flywheels.

In 1908, the Grubers bought the most advanced machine in their shop, a West tire setter. Powered by a hydraulic pump, the machine compressed an unheated metal band around a wooden wheel rim to serve as the tire. This saved hours of painstaking labor by blacksmiths who previously fired the metal and fitted it by hand. But the new process was at first a controversial one. Recalls 93-year-old Franklin P. Gruber, grandson of the works' founder and last owner of the shop: "We were largely criticized for it. Nobody would believe in such a thing—that you could tighten a steel tire by means of a cold process."

The tire setter sits in the first floor of the 80- by 60-foot building, along with the blacksmith's forge and a number of other power tools, including a spoke tenoning machine, a hub boring device, a mortising apparatus, and several shapers, sanders and saws—all connected by a net of black belts to the overhead drive system. Work benches with wooden vises and racks for hand tools line the rough wooden walls. Above are posters, calendars and advertisements (one promoting the "wonderful talking machine") dating from the turn of the century to recent years. Though wagon production reached its peak in the twenties, when the Grubers employed 20 men 6 days a week and built over 100 wagons a year, the factory still turned out wagons until the 1950s, and Franklin Gruber and his nephew John used the shop for repair work until 1972.

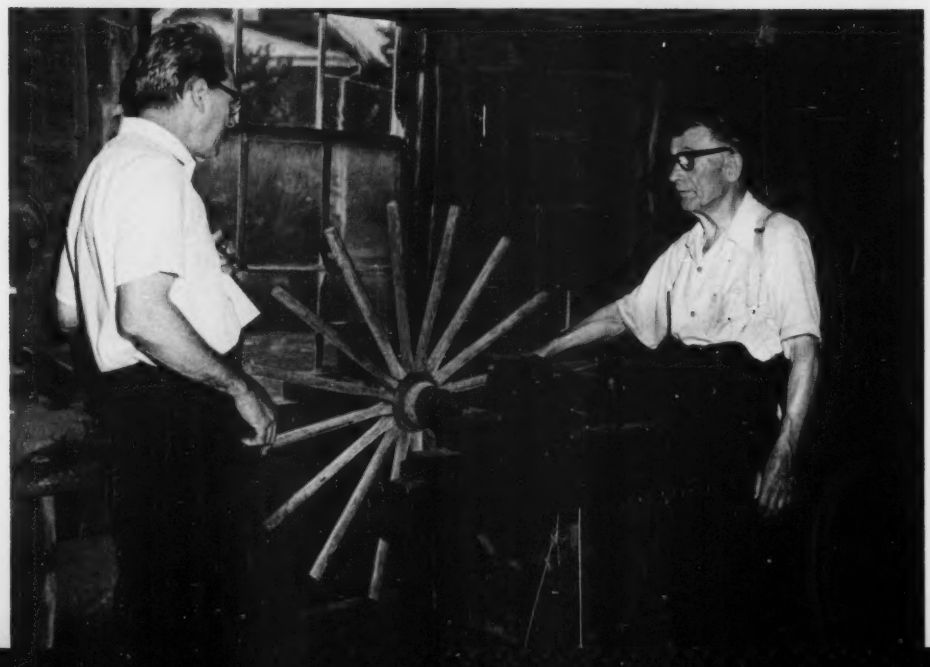
A small office also occupies a downstairs corner of the building. Here Corps researchers found numerous bills and correspondence tracing the history of the works ("He never threw anything away," notes Jaggard).

The second floor, away from the dirt and dust below, was used for applying the two coats of bright red and green paint that made the Gruber wagon easily identified by local farmers. Some decorative touches, usually lines

The author, currently a student at Harvard Law School, was an intern with *Water Spectrum* during summer 1975.

[1] A cleaving tool used to split logs to make spokes.

Gruber Wagon Works as it appeared in 1886, with founder, Franklin H. Gruber, fourth from right in photo at left. Today's structure contains wing at right added in 1905 to house hand operated elevator.



Franklin P. Gruber, right, founder's grandson and last owner, shows intricacies of wagon wheel making to Corps historian.

and scrolls, were added to all parts of the wagon, down to the brake shoe, and a stylized Gruber signature applied to the sides of the vehicle. The walls of the paint shop bear an inch-thick impasto of red and green, where workers tested their mixtures. The building's third floor holds scores of paint and linseed oil cans, and was also used to store wagons, parts and materials. A large hand-operated elevator connects the three levels and was used to move wagons and parts along a vertical assembly line.

Though the Grubers custom built many vehicles, they always maintained general stock for immediate sale that included the popular, standard farm wagon and the large hay bed. Farmers as far away as Ohio and Indiana bought Gruber wagons; one wagon recently turned up in California. The Amish, who live in the area near the works and shun the use of motorized vehicles, still buy and sell old Gruber wagons among themselves.

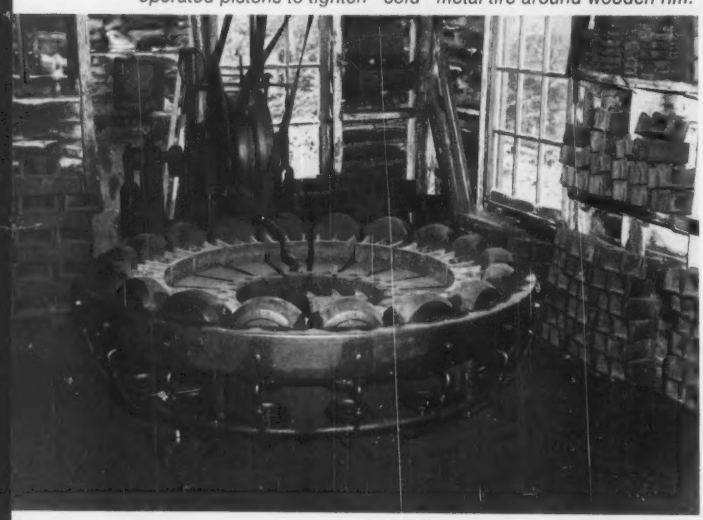
Franklin Gruber recalls "there was a lot of competition," among wagon makers of the day. "Some of the competition was as dirty as could be." The fatal competition, however, came not from rival wagon works that dotted the Pennsylvania countryside, but from the automobile producers in Detroit.

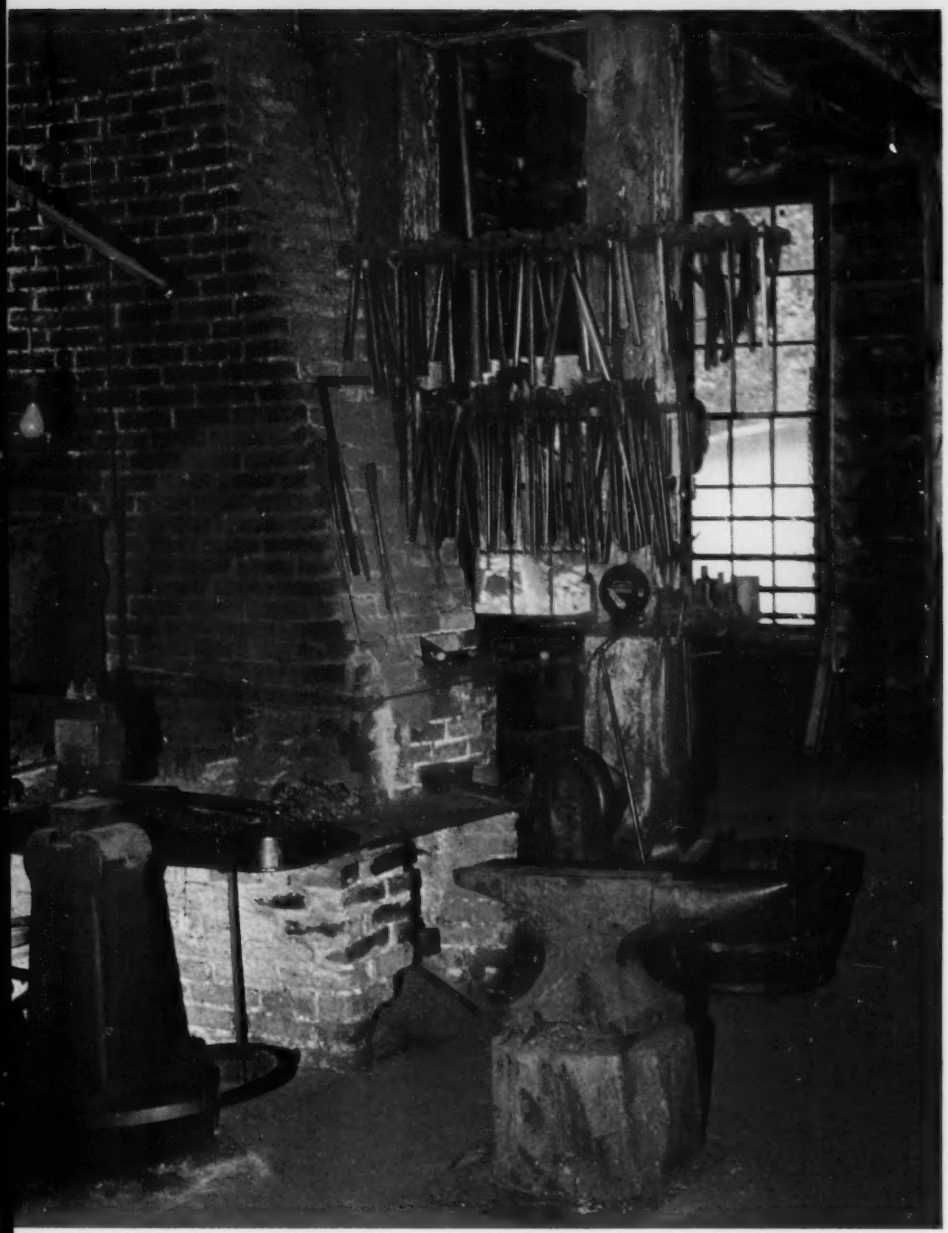
Yet somehow the Gruber factory managed to remain intact until the late sixties when preliminary studies of the Blue Marsh site drew attention to the historical significance of this turn-of-the-century wagon factory, still in working condition. The works stand in the area to be inundated and starting in 1970 planners from the Corps' Philadelphia District began meeting with local officials. Interested local citizens had the works placed on the Pennsylvania historic register in 1971 and the following year on the National Register of Historic Places. Finally, at a January 1974 meeting, one of the commissioners from Berks County, home of the wagon works, agreed to staff and maintain the factory as a museum in a county park a few miles from Blue Marsh. There was one condition though—first the Army had to get the

Gas-engine power from overhead belts drove this mortising machine acquired by Grubers in 1894.

Calendar dated 1948 marks approximate end of active wagon making era at Gruber works. Floor mounted power cutter was used for threading wagon bolts.

West tire setter, purchased in 1908, employed hydraulically operated pistons to tighten "cold" metal tire around wooden rim.





Blacksmith's anvil and hand tools were used to bend heated metal tires during wagon works' earliest days.

building there and repair the aging structure to make it safe for visitors.

Blue Marsh Lake, authorized in 1962 for the purposes of flood control, water supply and recreation, will be formed by impounding the Tulpehocken Creek 6 miles northwest of Reading, Pa., behind an 1800-foot long by 100-foot high dam. The resulting lake will have a surface area of 2200 acres at flood pool level and a storage capacity of 50,000 acre-feet of water. Cost of the project, to be completed in 1978, is $43 million.

Therein lies the problem. The $43 million figure, under Moss-Bennett, limits total authorizations for saving the Gruber works to a maximum of $430,000. And local officials don't have the resources to help.

Corps planners began to study possible options and their costs. For $460,000—only $30,000 over the 1-percent Moss-Bennett ceiling—all the equipment and some of the inner walls could be placed inside an inexpensive, prefabricated building to be constructed on the park site offered by the county. However, relocating the entire works and restoring the old building to make it safe for public use, the study found, carries a $920,000 price tag, based on estimates made early this year.

Those involved feel anything less than a relocation and restoration of both the building and its contents would significantly reduce the historical value of the

wagon works. In fact, the factory would probably be delisted from the National Register of Historic Places if the entire building were not moved.

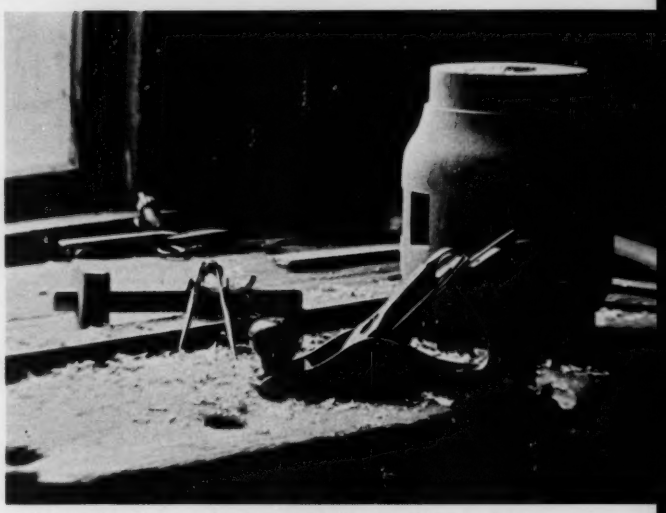
Fortunately, help was on the way. Officials from a local historical society organized a letter writing campaign to their congressmen in Washington. County officials also made requests, and they got results. Last April, Senator Hugh Scott of Pennsylvania introduced a bill (S. 1497) providing a special authorization to move and restore the Gruber building. In his introductory remarks Scott told the Senate: "Walking through the Gruber factory is like taking a stroll to the days of yesteryear when a horsedrawn wagon was the principal means of transportation. It is this sense of history which prompted me to initiate action to assure the continued protection and permanent preservation of the Gruber Wagon Works." [2]

A week later Congressman Gus Yatron, representing the district that encompasses Blue Marsh, introduced a companion bill in the House of Representatives (H.R. 6505). Both bills are in committee now and will probably be included in an omnibus water resources bill, scheduled for a final vote early next year. If the special authorization is approved, funds will then be requested to accomplish the work. (Authorization is the first of two required steps in funding any Federal program; the second is the actual appropriation.) The money will come none too soon for project engineer Jaggard, who needs to move the works by next summer since he must use a nearby road that also has to be relocated before the area is inundated in 1978.

Construction on the dam began in 1974, and last summer the Corps bought the works from Gruber. Fearing vandalism and theft, Corps officials have inventoried and stored everything that could be moved out of the building. The precise location of 19,000 items, including hand tools, machine parts and materials, was recorded, and architectural drawings were made of the entire building, so the works can be rebuilt exactly as it once stood. An 8-foot-high wire fence has been erected around the structure, and a 24-hour guard was hired to watch the building until all transportable items, many of them quite valuable, were removed for safekeeping.

Jaggard, who supervised all this work, had never dealt with historic preservation before, but, as he says: "The Gruber works are so unique that you can't help but get interested. The problem is allocating my time so I don't spend too much in this area. You have a tendency to get too deep into this thing." He adds that last year he often spent half his working day dealing with the old factory.

He is also concerned with other historic properties in the Blue Marsh area. The Corps plans to move an early-19th century cemetery out of the area to be inundated to the same county park site, and may also relocate one of a number of old houses and mills that dot the area. Architectural drawings will be made of others before they are demolished. And recently the Corps opened an "interpretive center" in an old barn on a site which will eventually overlook the lake. The center, operated by the Corps and open to the public, provides a few simple exhibits on the history of the Reading area, including the Gruber Wagon Works.



Finished wheel hub, wood plane and other hand tools reflect craftsmanship of the past at Gruber Wagon Works, found intact at future site of Blue Marsh Lake.

Such enthusiasm for history is not restricted to the Blue Marsh project. Across the country Corps personnel are attempting to salvage, move, restore and make available to the public historic sites of various sorts. "The history business is just booming all over the Corps," asserts J. A. Remington, the Engineers' chief historian. This interest is reflected in numerous projects. At Wister Lake in Oklahoma the local Corps office displays over 7500 Indian artifacts collected from the lake area. The Corps is also doing an architectural study of houses standing on the site of the proposed Caesar Creek Lake in Ohio, and is helping a local group move some structures to safe land above the future lake that the Army will lease to the group.

The Old Lock Pumphouse on the Chesapeake and Delaware Canal, built in 1837 and one of the finest remaining examples of pumphouse machinery, has been restored and opened to the public at Chesapeake City, Md. The canal also sports excellent fossil hunting sites for the public, and many fragments found there are displayed at a Corps-operated museum in the pumphouse building. The old Mill Springs mill on the shore of Lake Cumberland on the Kentucky-Tennessee line is being restored to a safe condition for public access. Across the country at least 50 historical and archeological sites listed on the National Register are on Corps lands.

In developing these resources for public display, the Corps recognizes that recreation can include not only hiking, camping and boating, but a dose of national heritage too. And Corps projects are used for recreation by more people than are the recreation lands of any other Federal agency.

The Corps has a larger number of historians than ever before, whose work includes the study of historical sites

[2] *Congressional Record*, April 22, 1975, p. S6457 (daily ed.).

Example of once popular hay bed displays now faded red and green colors and scrollwork that marked Gruber wagons. At left, Gruber shows off the standard farm wagon that was his factory's principal product.

as well as the chronicling of the Army's own history. A few districts have gone a step further, adding archeologists to their staffs.

Recently the Corps' Ohio River and Southwestern Divisions held conferences on the subject of historical preservation. Engineers and planners discussed the implementation and funding of preservation projects under the Moss-Bennett Act. Other divisions and districts have also held seminars with the same idea: find out how to best flex the financial muscle for historical preservation that Moss-Bennett has provided the Corps.

Not everything can be saved, however, especially when other pressing social needs compete for Federal dollars. A Corps planner who reviews funding requests for historical programs points out that "it's difficult to assess historical value. It's all very subjective. When it comes to spending the taxpayers' money, we must ask: Are the costs reasonable?"

There may be more than Moss-Bennett funds available in the future for important projects if another bill (S. 1707), also introduced by Senator Scott, passes Congress. This bill would provide a blanket authorization to the Secretary of the Army (acting through the Corps of Engineers) to preserve, restore and maintain any historic building or site listed on the National Register and located on Corps project lands.

Speaking for the bill, Senator Scott noted that recent Federal regulations place the responsibility for preservation of historic sites on those Federal agencies owning the surrounding land, whereas the National Park Service was once responsible for all such sites. Yet no law, he added, provides these agencies with a "clear-cut authority" to expend funds to fulfill this responsibility. Senator Scott termed the Corps' situation "somewhat incongruous" in that "a major Federal agency has been made responsible for historic and cultural resources located on lands under its jurisdiction, but lacks the authority to expend funds to insure the preservation of America's historic vestiges." [3] This bill is also in committee now.

Whether or not these bills become law, the Corps will still rely on the funds authorized by Moss-Bennett for preservation projects. From fossils to factories, Corps personnel are making ambitious plans for historic sites and structures across the country. They may be, as the sign says, "building tomorrow today," but not without a growing concern for the importance of yesterday. ■

[3] *Congressional Record*, May 12, 1975, p. S7783 (daily ed.).

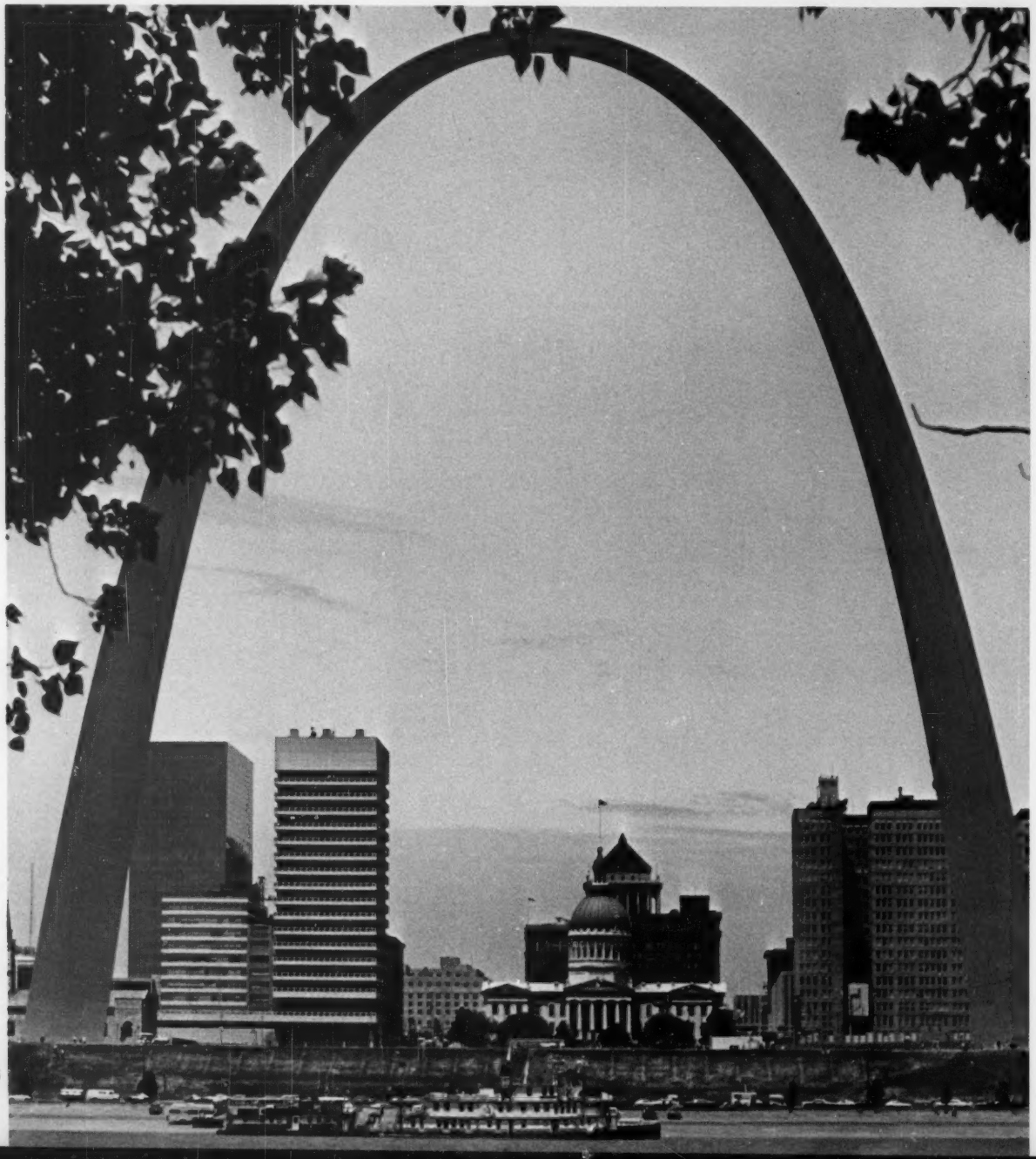
Events, Deeds & Deliberations

Launching The Floyd

On June 17, 1975 the U.S. Army Corps of Engineers began its Bicentennial celebration with the dedication of the *Sergeant Floyd* at the foot of the Gateway Arch in St. Louis, Mo. The 43-year-old, Corps-owned towboat was on the verge of being decommissioned when she was selected for this final, 18-month-long historic mission visiting ports of call along the Nation's Inland and Gulf Intracoastal waterways.

St. Louis was chosen as the dedication site because of its historical value to the development of our country —as the starting point of our Nation's expansion westward.

The elaborately decorated, floating Bicentennial exhibit tells the story of the Corps' contribution to the development of our country through its Civil Works program.



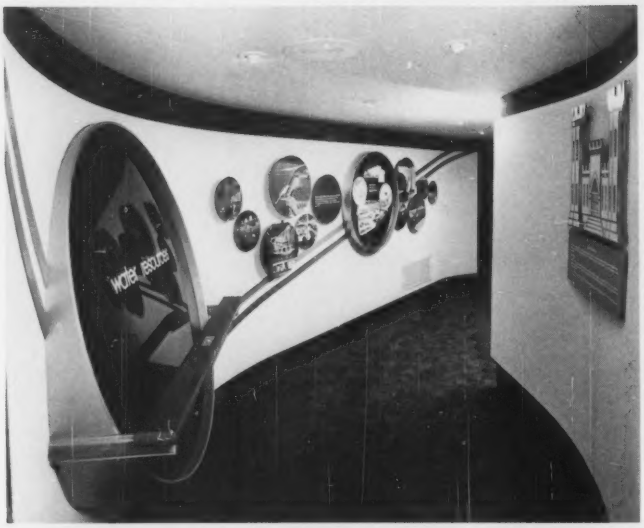
Opposite page—Berthed at the foot of the Gateway Arch, St. Louis, Mo., the Sergeant Floyd *awaits her Bicentennial tour dedication ceremony.*

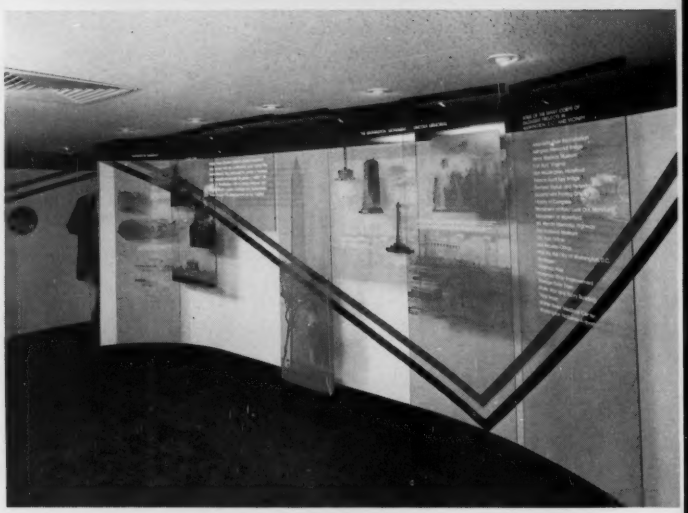
Above—Scale Model of the Sergeant Floyd *greets visitors inside the floating Bicentennial exhibit.*

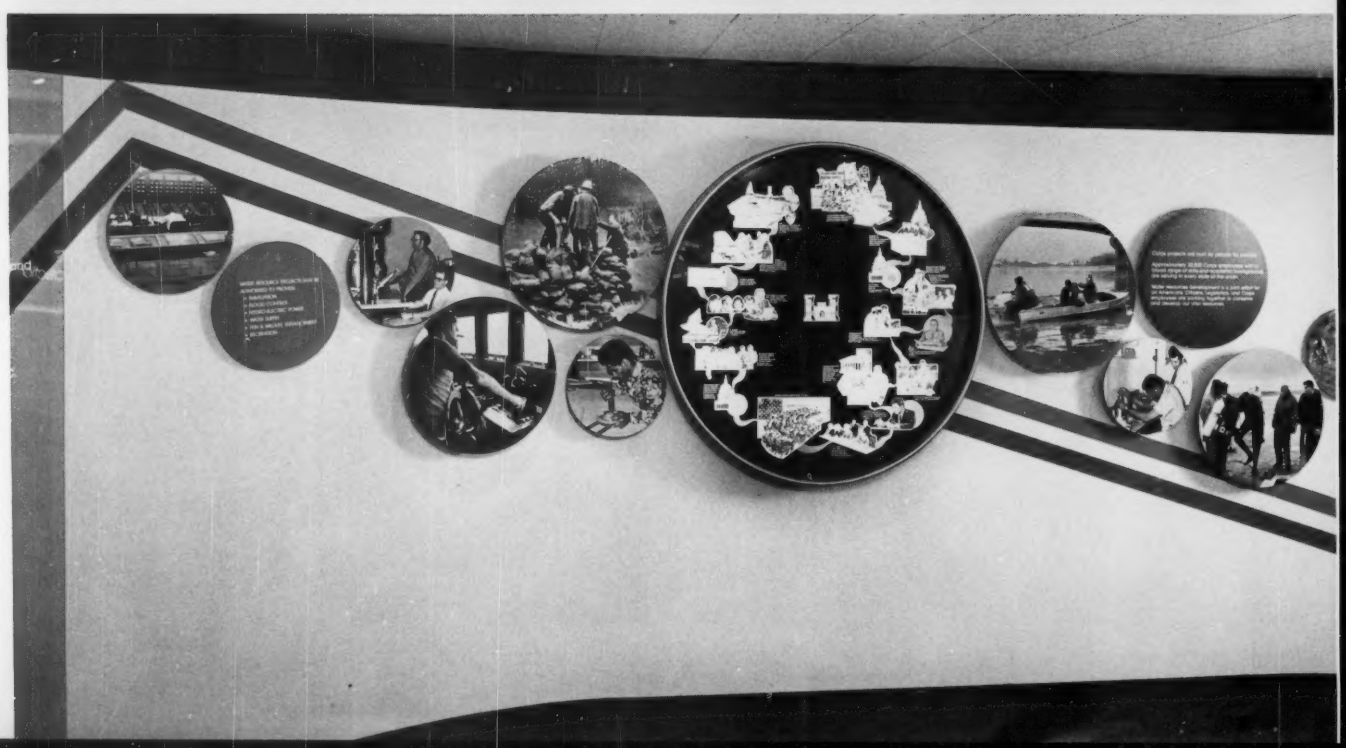
Left—A panel displays early Army Engineer missions.

Below—A family listens as a recorded message relates the birth of the Corps to the Battle of Bunker Hill.

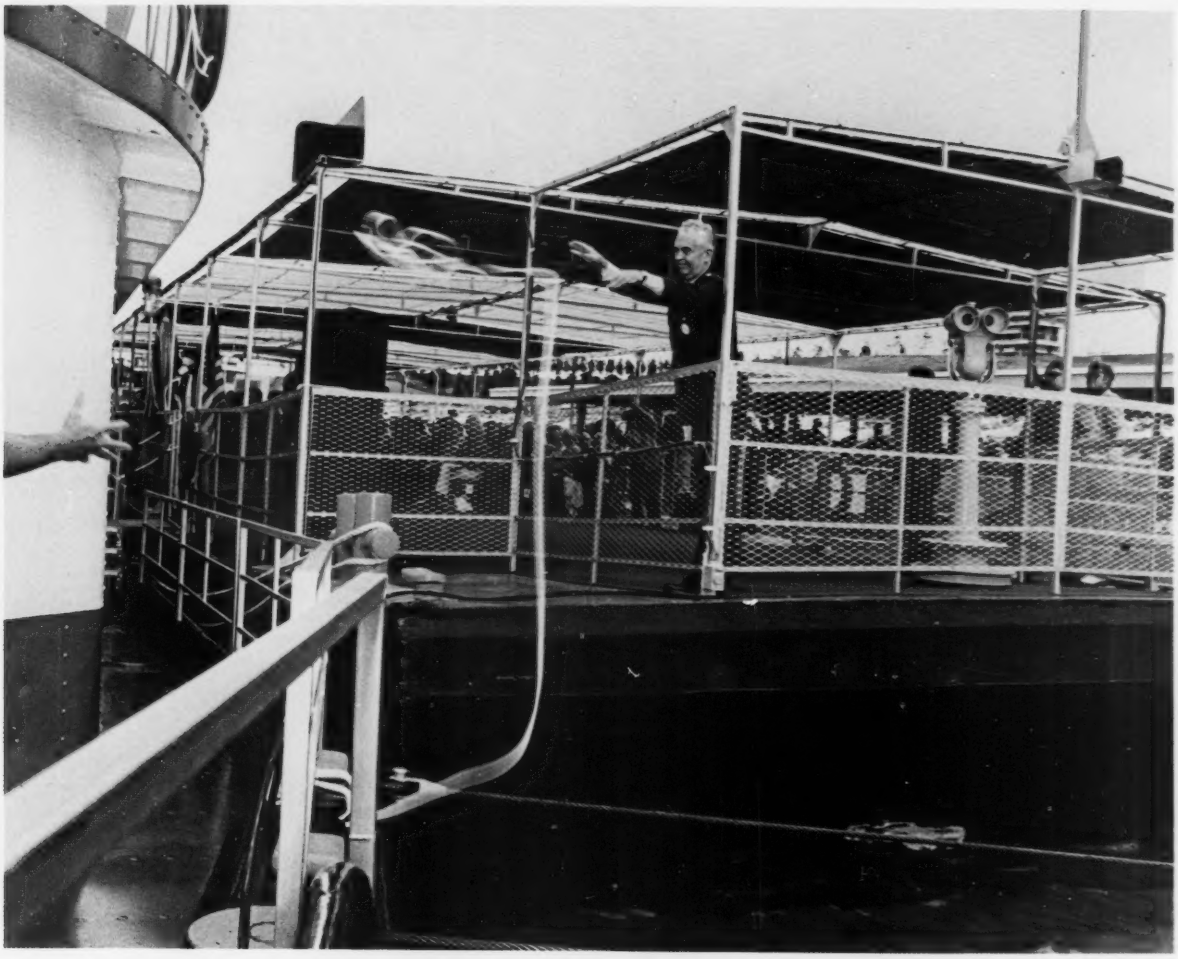
As our young Nation grew, so did the Corps' missions.







Lt. Gen. W. C. Gribble, Chief of Engineers, casts off, launching the Sergeant Floyd *on her final, historic mission.*



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